EXHIBIT 52
[FILED UNDER SEAL]

UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF TEXAS
SHERMAN DIVISION

The State of Texas, et. al. Plaintiff, v. Google LLC, Defendant.	Case No: 4:20-cv-00957

Expert Report of Joshua Gans

Joshua Gans

Dated June 7, 2024

Contents

I. INTRODUCTION

1. In this introductory section, I explain my assignment in this matter and my qualifications to provide the expert opinions in this report.

A. Assignment

2. On December 16, 2020, a multistate coalition led by the State of Texas filed a lawsuit against Google LLC (Google) asserting violations by Google of federal and state antitrust laws and violations of other state laws, in connection with Google's conduct in the online display advertising industry and as to digital advertising technologies ("ad tech" or "ad tech stack"). Currently, 16 States (Texas, Alaska, Arkansas, Florida, Idaho, Indiana, Kentucky, Louisiana, Mississippi, Missouri, Montana, Nevada, North Dakota, South Carolina, South Dakota, and Utah), and the Territory of Puerto Rico are Plaintiffs in the case (Plaintiff States). I was retained in September 2021, to provide expert analysis and opinions on behalf of all of the Plaintiff States.

3. I have been asked by counsel for the State of Texas, on behalf of all Plaintiff States in this case, to conduct economic analyses concerning Google's conduct as to the ad tech stack or digital advertising technologies that are at issue in this case. Specifically, as part of that assignment, I have been asked to: (a) analyze and define relevant antitrust markets, (b) evaluate whether and the extent to which Google has monopoly power in these markets, and (c) assess any effect or impact, if any, of Google's conduct on competition and consumers. I also understand that the Plaintiff States have the opportunity to submit rebuttal expert testimony and reports and that I may be asked to evaluate the reports and opinions offered by Google's experts in connection with those rebuttal reports.

4. A list of all documents considered in this report is attached as Appendix C. I have reviewed, signed, and complied with the Confidentiality Order entered in this case. My supporting team has also read, signed, and complied with the Confidentiality Order entered in this case. I have also reviewed the Stipulation and Order regarding Expert Discovery in this case.

5. I understand that document productions are ongoing in this case and that additional relevant documents may be produced in this case by Google and third parties right before and after I issue this report. I may, and reserve the right to, review and rely on additional documents in conducting my work and forming my opinions in this case. I reserve the right to supplement or amend this report if my opinions change or require supplementation as a result of my ongoing review of documents.

B. Qualifications

6. I am an economist and have been a university professor for over 30 years. I specialize in issues regarding technological competition and innovation, with contributions to the fields of digital economics, game theory, media/publishing, and regulation. I have received my Ph.D. in Economics from Stanford University.

7. I am currently a tenured Professor of Strategic Management and holder of the Jeffrey S. Skoll Chair of Technical Innovation and Entrepreneurship at the Rotman School of Management, University of Toronto. I am a Research Associate at the National Bureau for Economic Research and a Research Fellow at the Digital Business Initiative at the Massachusetts Institute of Technology. I am also the Chief Economist at the University of Toronto's Creative Destruction Lab, a highly successful development program for technology-based business ventures. I have previously served as a Professor of Management (Information Economics) at the Melbourne School of Business, University of Melbourne, and as a visiting researcher at Microsoft Research (New England).

8. I have published extensively on the nature of technological competition and innovation, media business models, market design, licensing/tariff negotiations, industrial organization, and regulatory economics. My work frequently appears in the leading peer-reviewed economics journals, including the American Economic Review, the Journal of Economic Perspectives, the Journal of Public Economics, Management Science, and the Journal of Law and Economics. In addition, I have authored several books, including Information Wants to be Shared (Harvard Business Press, 2012), The Disruption Dilemma (MIT Press, 2016), Prediction Machines: The Simple Economics of Artificial Intelligence (Harvard Business Press, 2018), Innovation + Equality (MIT Press, 2019), Power and Prediction: The Disruptive Economics of Artificial Intelligence (Harvard Business Press, 2022), The Economics of Blockchain Consensus (Palgrave, 2023) and Entrepreneurship: Choice and Strategy (Norton 2024). I have published extensively on the economics of the digital economy, particularly regarding the operation of platforms and advertising-funded business models and markets.

9. I have previously been retained by the US Department of Justice, the Federal Trade Commission and the Australian Competition and Consumer Commission to provide expert testimony on market power, copyright licensing, mobile phone regulation and telecommunications network competition. My consulting experience covers energy (gas and electricity markets), telecommunications, financial services and banking, intellectual property licenses, pharmaceuticals, and rail transport. I have recently worked on matters involving digital platforms, digital advertising, and cryptocurrency.

10. My CV attached in Appendix A lists my publications in the last ten years. A complete set of all my writings can be found on my website joshuagans.com. Appendix B lists the cases, during the previous 10 years, in which I have provided expert advice and testimony.

C. Compensation

11. My consulting rate for this matter is $1,000 per hour. Keystone Strategy assisted me in preparing this report. Keystone's billing rates ranged between $340 and $890, per hour, and I was compensated 10% of Keystone's billings for work on this report. My compensation does not depend on the outcome of this case.

D. Summary of opinions

12. While this case involves complex, technical conduct by Google, simple and understandable economics explain the anticompetitive nature of and harm caused by Google's conduct. Starting in 2008 with Google's acquisition of DoubleClick, Google began acquiring other ad tech companies and products involved in every aspect of the ad tech stack. Using its control of those products, Google then engaged in a number of different types of conduct—tying of its products, product restrictions, and auction manipulations that resulted in monopoly power in several related but distinct markets. This monopoly power harmed competition in these markets and injured consumers.

13. It is my opinion that there are four relevant product markets in this case: (1) the market for publisher ad servers used for the sale of open web display advertising inventory, (2) the market for ad exchanges for transacting indirect open web display advertising, (3) the market for ad buying tools for small advertisers for buying open web display advertising space and, (4) the market for ad buying tools for large advertisers. The relevant geographic market for each of these four markets is the United States. Google has committed various acts that have helped it acquire, maintain or enhance its monopoly position. These and other opinions in my report are based on my specialized knowledge in economics, review of facts and data, and application of established economic principles and methods to the facts of this case.

14. Specifically, my opinions and findings as to Google's monopoly power[1] are as follows:

a. As outlined above, Google has monopoly power in at least three relevant product markets in the relevant geographic market of the United States. These are (1) the

[1] In economics the term "monopoly power" means substantial market power, or the unconstrained ability to price a product above the competitive level, reduce quality, service and/or innovation below the competitive level, or exclude competition.

market for publisher ad servers used for the sale of open web display advertising space, (2) the market for ad exchanges for transacting indirect open web display advertising, (3) the market for ad buying tools for small advertisers for buying open web display advertising space. These findings are based on the specific features of those markets as well as the application of the hypothetical monopolist test.

b. Google had and continues to have a substantial degree of monopoly power in each of these markets at various times, facilitated by entry barriers and switching costs between providers of ad tech tools.

c. It is my opinion that Google has engaged in anticompetitive conduct that has enhanced and maintained its monopoly power in these relevant markets.

15. This conduct falls into three broad classes:

a. First, Google engaged in various effective and actual ties of products it supplied across the relevant markets that had exclusionary purposes and effects and that harmed competitive processes and market outcomes. Ties or tying of products can harm competition and market participants when customers are forced to buy one product in order to buy or access another product. The exclusionary and harmful tying in this case includes Google forcing publishers to accept a tie between Google's ad exchange (AdX) and its publisher ad server tools (DoubleClick for Publishers or DFP), which I describe in Section VI.

b. Second, Google implemented various restrictions with respect to its ad server tool that had the intent and the effect of harming the competitive process and steering publishers and advertisers towards Google's own products and away from rivals' products. In particular, Google implemented restrictions as to its ad server tool with the intent and effect of substantially lessening competition in the market for ad exchanges, referenced above. The ad server restrictions had the effect of raising the costs to Google's customers of utilizing alternatives to Google's ad tech tools for publishers. I describe Dynamic Allocation, line item caps, data redactions, and Unified Pricing Rules in Section VII. These restrictions and feature changes implemented by Google have steered demand towards Google's ad exchange product and other products.

c. Third, Google deliberately manipulated the auction process ("auction manipulations") by secretly deviating from sealed, second-price auction rules that publishers and advertisers were familiar with, and thus affecting each of the relevant antitrust markets. These manipulations were a form of algorithmic predation whereby Google used historical and real-time bid information to adjust the prices for some transactions that would otherwise have been completed on competitor platforms. Google deliberately hid these manipulations from Google's own customers (i.e., publishers) to subvert the competitive process. Had Google's customers known about Google's manipulations of the auction rules that customers were accustomed to, customers would have considered products from Google's competitors. Google's manipulations were undertaken with both the intention and the effect of substantially lessening competition in the ad exchange and ad buying tool market. I describe Bernanke and Dynamic Revenue Share (DRS) in Section VIII.

16. It is important to recognize that these types of conduct both: (a) individually on their own harm competition by taking advantage of monopoly power in one market to extend or maintain monopoly power or to harm competition in another market, and (b) are also interrelated and collectively part of a decade-and-a-half-long pattern of behavior on the part of Google to reshape and control the online display advertising industry. Starting with Google's acquisition of DoubleClick in 2008, Google has sought to integrate and then control all elements of the ad tech stack that constitute online display advertising. Google's course of conduct, summarized above and analyzed below, has achieved that end.

17. Combined, Google's conduct has subverted the very foundations of competition in the online display advertising industry.

18. In my opinion, expressed throughout this report, Google's conduct undermined the foundation of competition in at least the following three ways:

a. First, Google created restrictions and conditions that allowed Google to steer demand to its own products in the relevant antitrust markets along the ad tech stack. For Google's ad exchange, AdX, this funneling allowed Google to aggregate more advertising buyers and sellers than rival exchanges, making it increasingly difficult for rivals to attract buyers and sellers. This was reinforced by the reality in the online advertising industry that information drives the ability to identify high-demand advertisements, based on the quality of the matches between advertiser type and the

users associated with a given publisher. By being able to ensure that fewer transactions were completed on rival exchanges, Google was able to create conditions under which only advertisers and publishers using Google's ad tech tools could take advantage of information, rather than publishers and advertisers acquiring that information themselves and using it to bring high-demand prospects to rival exchanges with lower take rates.

b. Second, advertisers and publishers did not sit still as all of this happened. Google's conduct created conditions for strategic behavior by advertisers and publishers alike to circumvent the restrictions that Google itself had placed in their path. These actions were admittedly costly and harmful to market participants, which would not have taken such actions absent Google's conduct. For example, one such set of activities, Header Bidding, was utilized by publishers to encourage competition against Google's AdX and to allow publishers greater control of information that would in turn allow for more competition in markets along the ad tech stack. Such actions would not have been necessary if Google had not been integrated across the ad tech stack and if Google was supplying publisher tools on terms that were in the interest of publishers. Instead, Header Bidding was a work-around that itself created other strategic issues including multi-calling with consequences that reached through to harm outcomes in the markets for advertiser buy-side tools. Google initially reacted not by changing the underlying conditions that led to Header Bidding but instead by putting in place restrictions in its dominant publisher tool products to make it difficult for Header Bidding to be utilized or to otherwise disadvantage Header Bidding. That Google had a choice to act competitively from the start is indicated by its eventual relaxation of those restrictions in the face of competitive pressure from Header Bidding and the risk it faced should large publishers such as Facebook use these restrictions as an opportunity to enter the market. By that time, much damage to competition had already occurred.

c. Third, transparent pricing (or the ability to know the price you are paying for a service and to compare prices and the quality of products offered amongst suppliers) is a critical first step in allowing competitive forces to operate in a market. Instead, Google changed the bids and the auction price formation rules in ways that were deliberately hidden or opaque to market participants. Google obscured the full price those participants were paying when using or interacting with Google products and

denied them the opportunity to compare those prices with the prices of rival suppliers and for rival suppliers to make competitive price offers. The ability to exercise such choice is fundamental to the process of competition. Google could have varied prices and rules in ways that were apparent to participants but chose not to do so. Google was able to do this as a result of its monopoly power in the relevant markets and vertical integration across those markets. Absent those two conditions, Google could not have engaged in the harmful conduct it engaged in.

19. In summary, while this case involves complex, technical conduct, it has simple, understandable economics at its essence. Google used and uses its monopoly power to engage in conduct that harmed competition in the relevant markets. Google has the incentive and ability to engage in this harmful, anticompetitive conduct because of its vertically integrated structure or ownership and control of products along the ad tech stack. The end result is a less competitive online display advertising industry in the United States, higher prices charged by Google, and lower quality products[2] than would be supplied in a competitive market.[3]

II. THE ECONOMICS OF ONLINE DISPLAY ADVERTISING

20. Before turning to the main parts of this report, I provide a high-level overview of the economics of online display advertising, based on my specialized knowledge in economics, and review of the facts and data in this case.

21. At its heart, the economics of advertising are relatively simple. Publishers' own websites or webpages that contain space to display advertisements or "ads" to anyone who visits their websites. Publishers attract consumers to read their website content, and alongside that content, they offer up space (or inventory) for ads. The total amount of inventory they have available (their production capacity) depends on how many ads they place on a webpage and the number of times consumers view that webpage. That is, unlike a static ad in a traditional print newspaper or publication, a single ad space on a

[2] By lower quality, I mean less of features or abilities desired by consumers.

[3] I understand that certain Plaintiff States are seeking civil penalties under their respective state antitrust or unfair competition laws for the anticompetitive conduct of Google. I understand further that the Plaintiff States Alaska, Arkansas, Florida, Idaho, Kentucky, Louisiana, Mississippi, Montana, Nevada, North Dakota, Puerto Rico, South Carolina, South Dakota, Texas, and Utah seek civil penalties for violations of their state antitrust statutes, and that Kentucky reserves the right to seek a per day penalty as set out in its state statute. My analysis and opinions in this report show that Google engaged in the following anticompetitive conduct, which I understand underlie the Plaintiff States' penalty requests: Tying, Dynamic Allocation, Dynamic Revenue Share, Bernanke, Enhanced Dynamic Allocation, Header Bidding Line Item Caps, Header Bidding Data Redactions, and Unified Pricing Rules. I also address additional conduct—Project Poirot and Google's Facebook agreement—aimed at limiting the impact of Header Bidding. Collectively, the conduct I have analyzed in this report constitute a pattern of anticompetitive behavior on the part of Google.

webpage can be sold to different advertisers at different prices for each individual consumer who visits that webpage. Advertisers are potential purchasers of ad space and can range from small, family-run companies to the largest brands. Advertisers place value on being able to attract the attention of those consumers who are willing to pay to place their ads in publisher ad space. Thus, the publishers supply ad space that the advertisers demand. Although the number of online ads transacted per day is in the billions, under economic principles, it is considered fundamentally limited by the attention and webpage visits of consumers and the publisher's choice regarding how much of a webpage is devoted to ads. This limitation creates a positive price for the placement of advertisements, and advertisers decide whether they are willing to pay that price or not. The price will adjust until supply equals demand.

22. While it is possible to consider the advertising industry in terms of supply and demand as one might view the markets for apples or oranges, advertisers are not necessarily interested in placing ads in front of any random consumer but, instead, place more value on attracting the attention of the consumers who might be more likely to purchase their products or services. For publishers, if they have some means of providing advertisers with information regarding the types of consumers they are attracting, then there is a potential for a higher quality match — that is, advertisers know more about what they are paying for and publishers can take their scarce advertising space and find advertisers willing to pay more to place an ad in that space.

23. It is precisely on this dimension that the advertising industry has evolved. Market design economists Jon Levin and Nobel laureate, Paul Milgrom described what happened in pre-Internet media:

> Internet advertising markets have broken sharply from the advertising markets for traditional media. In the older media, every consumer that received a particular magazine, listened to a particular radio program, or watched a particular TV show would read, hear or see the same advertisement. An advertiser that wanted to reach an audience with particular characteristics could do so only within narrow limits. For example, a beer company might advertise on televised football games, and a maker of fashion clothing might advertise in women's magazines. Although publications do some tailoring of their offerings, as when a newspaper has different local editions, audience mix is nevertheless constrained by the audiences for each type of publication, rather than by the objectives of the advertiser or the current intentions of the viewer.[4]

24. The Internet offers various means of increasing the flow of information to improve the quality of matches between content providers and advertisers. One such evolution was in the separate context of Internet search, where search engines (notably Google) offered advertisements based on keyword

---

[4] Levin, Jonathan, and Paul Milgrom. "Online advertising: Heterogeneity and conflation in market design." *American Economic Review* 100, no. 2. 2010. pg. 603.

searches. Those searches were themselves an indication of a consumer's intent, making the potential flow of information from the search engine to advertisers quite rich.

25. In many respects, online display advertising that is provided on the web pages of publishers has been trying to emulate the richness of information that search advertising potentially allows. The more that publishers (or some other intermediary) can tell advertisers about the composition and potentially the purchase intent of their consumers, the higher the quality of matches that can be achieved.

26. Seen in this light, the online display advertising industry runs on information. While the forces of supply and demand operate to clear or facilitate transactions and auctions in the market for publisher ad space, the value created is facilitated by finer knowledge and more precise targeting of ad space to the interests of advertisers. Thus, the challenge for participants in the online advertising industry is to determine how to improve the value of matches between publishers and advertisers and, in the process, make sure publisher ad space is allocated to its most valuable outcomes. If this is achieved, then the value of publisher ad space is maximized, improving their revenue (or yield) while, at the same time, creating longer-term incentives for new publishers to provide content for consumers and attract more consumer attention that ends up expanding the scope for more advertisers to reach consumers. In other words, the better the day-to-day job of advertiser-publisher matching is achieved, the healthier and more value-creating the online advertising industry becomes.

27. One economic field implicated in this case is that of market design (including auctions). With respect to this field, economists have a well-established interest in the efficient operation of markets that use various mechanisms, both informal and formal, to match transacting parties within those markets. Economists have used a market design perspective when evaluating the efficient operation of industries that have high volumes of transactions, such as those that underlie financial markets. High volumes of transactions are also a hallmark of and necessary to the online advertising industry. For each of the markets under examination in this report, the nature of their operations can contribute to the efficient operation of the entire online advertising industry. The market design lens is particularly relevant here as a tool for economic analysis because so many of the elements of the online advertising industry are, as we will see, determined by the rules and arrangements that are necessary to achieve the high volume of transactions in those markets.

28. The design of markets (including auctions) has become an important field in economics. Economists have learned some broad principles regarding when markets work well and when they do not,

and those principles have carried over to the design of markets themselves. That design effectively sets the "rules of the game" whereby market participants interact.

29. Al Roth, a Stanford economics professor and Nobel Prize winner for his contributions to market design, identifies three criteria for the efficient design of markets.

> [T]o work well, marketplaces need to:
>
> 1. Provide *thickness* – that is, they need to attract a sufficient proportion of potential market participants to come together ready to transact with one another.
> 2. Overcome the congestion that thickness can bring, by providing enough time, or by making transactions fast enough, so that market participants can consider enough alternative possible transactions to arrive at satisfactory ones.
> 3. Make it safe to participate in the market as simply as possible
>   (a) as opposed to transacting outside of the marketplace, or
>   (b) as opposed to engaging in strategic behaviour that reduces overall welfare.[5]

30. Roth's criteria apply to the operation of online display advertising, and I will apply them in this case.

31. On Roth's first criteria of "thickness," an industry operates more efficiently when underlying transactions take place in thick environments; that is, when there are many buyers and sellers. For online advertising, this means that publishers want many potential advertisers to consider bidding for their space while advertisers want many possible publisher spaces for which to bid. Thickness is a particular challenge in the advertising industry because there may not be many ideal advertisers (and hence bidders for ad space) for a particular consumer of the publisher. However, as long as it is relatively frictionless for advertisers to bid for particular consumers' attention, the diversity of advertisers themselves can create a greater level of thickness. For instance, while there may only be a few advertisers who want to sell something to a consumer right now, there may be many advertisers — called brand advertisers — who are just interested in providing more general and less time-sensitive information to consumers. Thus, the diversity of advertisers increases the thickness of online display advertising auctions. Similarly, for advertisers looking to bid for the attention of a given consumer, if there is sufficient information about the set of websites a consumer may visit over a period of time, then advertisers have more options of where to place their ad for that consumer.

32. As discussed below, developments in online display advertising have the potential to increase thickness, e.g., allowing advertisers to use multiple exchanges to bid for a publisher's ad space and

[5] Roth, Alvin E. "What have we learned from market design?" *Economic Journal* 118, no. 527. 2008. pg. 286 (emphasis in original).

allowing publishers to solicit bids from multiple exchanges. On the flip side, however, thickness decreases or is undermined by impediments to publishers' or advertisers' use of multiple exchanges and ability to assess and compare different exchanges, including understanding the quality of the matches that might be achieved on one exchange versus another. Later in the report, I document and analyze Google's conduct with respect to tying various advertising products together in ways that limit the ability of advertisers and publishers to interact with exchanges other than Google's own exchange, AdX. Alongside direct competitive concerns, this conduct creates additional inefficiencies by undermining the market thickness that might otherwise be achieved.

33. With respect to Roth's second criteria of overcoming the "congestion" that thickness can bring, Google's conduct has also created inefficiencies, despite developments in online display advertising that would otherwise reduce inefficiencies in the matching of advertisers and publishers. For example, the introduction of real-time bidding took the guesswork out of which channels advertisers could access and bid for publisher ad space. Also, the creation of independent sell-side (publisher) and buy-side (advertiser) tools, which allowed publishers and advertisers to efficiently manage the billions of simultaneous auctions that were being run in order to target particular consumer-advertiser matches. This helped reduce inefficiencies in the matching of advertisers and publishers, as market participants no longer had to guess how to interact with markets at scale. By extension, any restrictions on those ad tech tools that leads to market participants doubting whether they were being presented with the best options would subvert those benefits. Later in this report, I document Google's conduct with respect to creating restrictions on the operation and flexibility of Google's own sell-side tools that caused publishers to make costly investments to provide that flexibility, the costs of which were made higher by Google's own conduct. Alongside the direct competitive concerns from this conduct, namely steering market participants towards Google's exchange AdX, this conduct created additional inefficiencies in matching publishers and advertisers.

34. Finally, as to Roth's third criteria of safety, Google's conduct makes it less safe or a less trustworthy environment for participants in the relevant markets.[6] To understand this criterion, it is important to understand the role of ad exchanges and automation in the online display advertising industry. With the growth of online display advertising to billions of auctions per day, the industry has moved towards more automation. Thus, whereas traditional media might have relied upon sales departments to locate advertisers and negotiate ad placements, the sheer volume of transactions in online markets made such manual negotiations effectively impossible, particularly given the need to create flows

[6] Safety is defined in a broad sense.

of information to facilitate better advertiser-consumer matches. The need for automation has led to buy-side and sell-side tools that facilitate the placement of bids or reserve prices from advertisers and publishers on ad exchanges. Other large-volume transaction industries have similar automated processes for the programmatic matching of the sell-side and buy-side. For instance, the stock market operates this way, whereby buyers and sellers submit offers to an exchange, which then matches these bids.

35. A critical difference between ad exchanges and stock markets, however, is that the stock exchange itself is not owned and controlled by a single participant on either side of the market. Many high-volume exchanges are independently operated because market participants expect and need to trust that trades will take place without interference based on the interests of particular participants. This is a simple principle that any school child knows — you don't want an active player in the game to also be the referee. If, for example, the bids given by advertisers were being altered, then neither advertisers nor publishers would trust that the offers were real and would look for ways to alter their behavior accordingly. In some cases, they would prefer to bypass exchanges that have potential conflicts of interest. However, if those exchanges also controlled key tools for accessing markets on either side (or both sides), then market participants may not have the option to use another exchange.

36. Levin and Milgrom provide an example of issues that may arise in online advertising markets with respect to safety.

> One cost of excessively fine targeting in an Internet advertising market is the possibility of cherry-picking by savvy advertisers. One anecdote we have heard is illustrative, if possibly apocryphal. It involves a proposed contract between McDonald's and Yahoo! under which Yahoo! would have shown Happy Meal ads when the sun was shining or the stock market was up. Presumably this "happy contract" would have left rainy days when the market was down for untargeted Burger King or Wendy's ads.
>
> The possibility of cherry picking makes markets unsafe for buyers. An advertiser who purchases impressions to be shown on a newspaper Web site may expect that its ad will be shown to a representative cross-section of the newspaper's readers, just as in the print newspaper. But if the publisher does not protect this representativeness, the advertiser could be stuck with a collection of picked-over impressions. Even if advertisers are aware of this prospect, the unsafe nature of the market can still create the sort of high transaction costs that good market design avoids—forcing advertisers to monitor where their ads are being shown and how the ads are performing.[7]

37. Biases of this kind may cause publishers to be reticent to offer ad space or to do so with low reservation prices. They may also prevent advertisers from assessing the value of their ads and reduce

---

[7] Levin, Jonathan, and Paul Milgrom. "Online advertising: Heterogeneity and conflation in market design." *American Economic Review* 100, no. 2. 2010. pg. 606.

their ad spending. To counter this, market participants need to know and trust that what their ad tech tools claim to be doing is actually what they are doing.

> A user's interests at the current moment may be harder to discern, the environment is less consistent, clicks may be less indicative of ad effectiveness, and inventory and data are more disaggregated. So it seems plausible that the ability to identify relevant opportunities resides at least to some extent with advertisers or third parties acting to aggregate information.[8]

38. Pointedly, Levin and Milgrom argued that undermining safety could undermine the ability to have markets that engaged in more fine-targeted and freer information flows and may cause a consolidation whereby older-style bigger deals with a larger player might emerge. It is not hard to see that this would reduce the overall level of competition in the online display advertising industry.

39. Later in this report, I document a series of auction manipulations that Google secretly engaged in that risked trust in market operations and the safety criteria for those markets. Google undertook these auction manipulations precisely because Google was both a referee and a player. Google's market power in the markets for ad tech tools on both sides of the exchange market allowed it to engage in auction manipulations in ways that subverted the ability of market participants to make choices that are the first step in generating a competitive process. Alongside the direct competitive concerns from this conduct, namely steering demand towards Google's own ad exchange AdX, this conduct created additional welfare costs as the relevant markets were less safe than they might otherwise have been, impacting publishers and advertisers. Google's conduct also created the conditions that facilitated increased concentration in the long-term, undoing many of the benefits that would have otherwise arisen in the online display advertising industry.

III. INDUSTRY BACKGROUND

40. The following section provides background for my subsequent analyses by presenting an overview of online display advertising and the introduction and evolution of relevant ad tech tools.

A. Relevant Parties

41. The relevant parties for this case include industry participants: website users, publishers, advertisers, and providers of ad tech tools.

[8] Levin, Jonathan, and Paul Milgrom. "Online advertising: Heterogeneity and conflation in market design." *American Economic Review* 100, no. 2. 2010. pg. 606.

42. Website users consume content on the Internet produced by publishers and view the ads placed on the websites they browse. Website users agree to allow publishers' websites to collect data on their characteristics and web browsing behavior, and advertisers leverage this data to target ads more effectively to users; the ads displayed on any given webpage are, therefore, specific to the user viewing it.

43. Publishers are content creators, such as websites and blogs, that utilize display advertising and ad technology to monetize their content. Publishers utilize Google ad technology products, and Google's actions significantly impact the digital publishing business model.

44. Advertisers seek access to publishers' websites' users to promote their brands. Advertisers often utilize advertising agencies for services, enabling brands to reach their advertising campaign goals. Throughout the report, I regroup buy-side players (brands advertising their product and services, and agencies) using buy-side tools under the general term "advertisers." Advertisers also utilize Google ad technology products.

45. Providers of ad tech tools are companies that sell software and tools used to facilitate the buying and/or selling of online display advertisements, helping publishers and advertisers automate their processes and enable large volumes of transactions to take place within seconds. The most relevant ad tech tools include ad servers, which manage publishers' inventory, ad buying tools, which help advertisers optimize their purchases of impressions, and ad exchanges, which act as real-time auction marketplaces to clear transactions. Google is one of the largest providers of ad tech tools and has a significant role in ad tech and advertising services. Google operates a publisher ad server, ad exchange, and ad buying tool for small advertisers, and an ad buying tool for large advertisers.

46. I describe the relevant parties in further detail in the following sections.

1) Website users

47. Website users consume content produced by publishers on websites. For instance, a website user can click on The Wall Street Journal's website to read an article, scroll down the webpage, and navigate to other sections and pages on the website to access more content. When the user visits a webpage, they can be exposed to ads placed on the website; common ad formats include static text/images, animated ads, videos and interactive ads. These ads are typically placed at the top, bottom, or sides of a webpage (called banners). Users can also encounter interstitial ads, i.e., full-page ads which appear while waiting for a webpage to load; pop-up ads, i.e., small windows that appear over a website's content; or rich media display ads, i.e., interactive ads that can include video, audio, and clickable elements. Users may also

come across retargeting display ads, which are ads placed by websites they have previously visited in order to remind them of the brand, or native display ads, which look and feel like the surrounding content but are labelled as "sponsored" or "promoted."[9]

48. The user chooses to either direct their attention towards the ad or ignore it. The user may not see the ad or deliberately scroll past it. In some instances, the user may look at the ad and scroll past it, but recall the information and engage with the offerings of the advertiser at a later stage, after they have exited the webpage. However, if the ad interests the user, they can click on it and make a purchase or sign up for a service from the advertiser. How the user engages with the ad depends on the stage of their customer journey. I discuss this in more detail when I discuss the marketing funnel in Section III.B.2.

49. Advertisers leverage user data to target ads to specific users. When a user visits a particular website, the website requests permission to enable cookies on their browser (e.g. Chrome or Safari); cookies are essentially text files with small pieces of data used to identify the user and improve their web browsing experience, e.g. being able to recall login information, shopping carts etc. Based on these cookies, information about the user is communicated from the publisher to the advertiser (e.g. the user's location). When a user visits a webpage, the advertiser is able to identify and track various characteristics and behaviors and place a value on the ad space each individual user will see. For example, a real estate agency based in New York City will place a higher value on advertising to a user in New York than a user in San Francisco. The advertiser can also then track the subsequent actions taken by the user (e.g. whether they clicked on the ad, or subsequently made a purchase),[10] which further helps them identify the types of users that are most valuable e.g. the advertiser can see that the users in New York click on the ad more often than the users in San Francisco.

[9] Semrush. "Display Ads: What They Are, Types, & How They Work" (October 26, 2023). Accessed on April 29, 2024. https://www.semrush.com/blog/display-ads/ ("Display ads appear online when users are already browsing […] There are many types of display ads […] Static ads: Simple, non-moving ads that can consist of text and images […] Animated ads: Use motion to capture attention. Created as GIFs or HTML5 files, they can display multiple frames […] Video ads: Use moving visuals and sound […] Interactive ads: Engage users through clickable elements, forms, or other interactive features […] Banner ads are graphics that can appear at the top, bottom, or sides of webpages. They leverage a combination of texts and visuals […] Interstitial display ads are full-screen ads that cover the interface of a website or app. They usually appear during natural transition points. Like when you're moving between app screens or waiting for a webpage to load […] Pop-up ads are small windows that appear over a website's content […] Rich media display ads are interactive ads that can include video, audio, and clickable elements […] Retargeting display ads help you re-engage individuals who have previous interacted with you on your website or app but didn't make a purchase of take a desired action […] Native display ads look and feel like the content around them […] They are usually labelled as 'sponsored' or 'promoted' to maintain transparency")

[10] Google Ads Help. "Evaluate ad performance on the Display Network" (undated). Accessed on April 29, 2024. https://support.google.com/google-ads/answer/2404178?hl=en ("Find out where your Display ads are appearing […] Analyze the audiences your campaigns reach using impressions, clicks, and conversions […] Figure out which audiences and targeting choices are working")

50. The quality of the advertisements that the user is exposed to contributes to their user experience and may affect whether or not they visit a particular publisher's website in the future. As more than 90% of advertisements are purchased through automated software, some advertisements may be irrelevant, misleading, or contain fake news.[11] Publishers would prefer not to show low-quality ads on their websites as these ads affect how they are perceived by users; in fact, Bloomberg no longer allows third parties to display ads to their audiences through automated ad auctions and requires advertisers to work with them directly.[12]

2) Publishers

51. Publishers of open web display advertising are websites consumers visit daily to sell off online real estate for display ads. According to Google, publishers include "news publishers, broadcasters, creators," etc.[13] Publishers are consumers of ad tech products that facilitate this scale and display of web display advertising as well as managing numerous aspects of this process.

52. As explained in Section III, before the rise of the Internet, modern advertising included printed display ads in newspapers, magazines, or on billboards, as well as other media such as TV and radio advertising. Newspapers and broadcasters would sell ad space or airtime to subsidize their content, and advertisers would buy advertising opportunities to promote their brands or specific products and services to the audience of these media.

53. As the Internet developed in the 1990s, traditional publishers began to adopt new ways of selling advertising space as they moved their content online. Online publishers, whether or not they had a legacy print media business, were no longer selling space on physical pages of newspapers and magazines, but instead were selling space online on their web properties. Publishers could offer space on their websites for digital ad creatives, such as banner ads, displayed on websites.[14]

---

[11] The New York Times. "Why Are You Seeing So Many Bad Digital Ads Now?" (February 11, 2023). Accessed on April 29, 2024. https://www.nytimes.com/2023/02/11/technology/bad-digital-ads.html ("In the past, buying a newspaper or television ad usually involved calling up a representative who would manually review and place the ad. Now, more than 90% of spending on digital display ads happens through automated software […] advertising experts agree that crummy ads – some just irritating, others malicious – appear to be proliferating […] third party brokers and automated auctions of ad space, which deal with enormous volumes and are more likely to miss low-quality ads")

[12] Bloomberg. "Shifting to an Audience-First Mentality" (October 24, 2022). Accessed on April 29, 2024. https://www.bloombergmedia.com/press/shifting-to-an-audience-first-mentality/ ("As such, we need to be more attuned to the user experience […] we've decided to take a major step in developing a modern digital experience that supports this 'audience first' mentality […] Starting January 1, 2023, Bloomberg Media will no longer allow third parties to sell ads to our audience through open-market third-party programmatic […] Going forward, if brands want to reach our audience, they'll need to work directly with our world class media team")

[13] GOOG-DOJ-AT -01450077 at -091. "An Ad Tech Primer" (June 3, 2020). Internal Google presentation by Brand Studio.

[14] "There are two ways display ads can be traded; through open display channels or through closed channels. Open display channels can be used by different website publishers to sell their ad inventory to many advertisers. Closed channels (also called

54. Publishers sell their ad inventory with a view to maximizing their profits. As part of this, some publishers pay particular attention to the quality of the ads displayed on their websites. A poor-quality ad (fake news, advertising for fake products, scams, etc.) can reduce users' perception of the quality of a publisher's content and significantly decrease user experience. A poor user experience decreases the retention of customers, which is a key metric determining a publisher's monetization opportunities. Thus, publishers will often be concerned about the quality of ads and control over the ads displayed on their properties.

55. Publishers can serve various forms of ads based on the format of their content. Publishers perceive these different deal types as complementary sources of monetization, and "fundamentally believe they get maximum yield through a broad mix of deal types."[15] For example, The New York Times can serve print, online display, and in-app ads. However, The New York Times does not have the option to serve search ads, given it is not a search engine.

56. Google itself is a publisher that owns and operates multiple web and mobile properties including: Google Maps (online map service), Gmail (email), Google Search (search engine), Android (mobile operating system), Google Chrome (web browser), and YouTube (video-sharing site).[16] Google's vast array of properties allows Google to collect data and track users,[17] and monetize various digital advertising channels, such as search ads on Google Search and video ads on YouTube.

---

owned and operated channels), on the other hand, involve publishers selling their ad inventory directly to advertisers using their own systems. Social media platforms, such as Facebook, operate closed channels to sell their advertising space." *See* Australian Competition Consumer Commission. "Digital advertising services inquiry. Final report" pg. 2 (August 2021). https://www.accc.gov.au/system/files/Digital%20advertising%20services%20inquiry%20-%20final%20report.pdf

[15] GOOG-NE-13244847 at -848. "Re: Update on AdX YM: Client feedback and Latest Progress" (February 2, 2011). Internal email thread between [redacted], [redacted], [redacted] and others.

[16] Business Insider. "All the companies and divisions under Google's parent company, Alphabet, which just made yet another shake-up to its structure" (February 12, 2020). Accessed on May 1, 2024. https://www.businessinsider.com/alphabet-google-company-list-2017-4 ("All of Alphabet's "traditional" products – like Chrome […] Google Cloud houses G Suite, which includes Hangouts Meet, Calendar, Mail […] YouTube was acquired in 2006 and remains a subsidiary of Google. The video-hosting site […] Google's core product, web search, remains under the Google umbrella […] Google Maps is part of Google's core business and by 2016, had more than 1 billion monthly users […] Android: Google's mobile operating system")

[17] The Sydney Morning Herald. "How Google harvests and uses your data, and what you can do about it" (July 29, 2020). Accessed on May 1, 2024. https://www.smh.com.au/technology/how-google-harvests-and-uses-your-data-and-what -you-can-do-about-it-20200728-p55g95.html ("Google's business model is built on collecting data about consumers when they use its services […] If you have an Android phone, or use your Google account with certain apps or services on the iPhone, there's a good chance the data associated with the apps you use and your physical location is also collected. If you use the Chrome web browser, a record of sites you visit may be kept. Even if you're not signed in to your Google account, Google can use device identifiers to verify it's you […] data is also used by Google to power its lucrative ads business")

57. Publishers are limited in the type of inventory they can sell by the content and nature of their online business. Publishers without their own mobile apps cannot sell in-app advertising. Without video content, a publishers cannot offer video ads.[18]

3) Advertisers

58. Advertisers of open web display advertising are businesses or individuals who seek to promote their products, services, or their brand, and they use display advertising to reach their target audience and elicit certain actions, such as visiting their website or making a purchase. Advertisers can target their ads towards customers that are more likely to purchase the product, for example, based on demographics such as age, gender, location, etc. or the users' online behavior such as browsing history. In addition, advertisers can directly track the performance of their advertising campaigns, such as how many people and what types of people view the ad, click on it, make a purchase, etc., which allows them to refine their targeting and maximize their return on investment. This can make display advertising more cost-effective than traditional channels like television or print, as advertisers can flexibly set budgets and target audiences.

59. As an illustrative and simplified example, a company for sporting goods may target ads towards users whose online behavior shows interest in sports and while monitoring the performance of the ads, observe that the ad leads to more clicks and purchases from people in the 25-34 age range than other age groups. The advertiser can then refine their targeting and budget to focus more on users in the 25-34 age group and therefore, maximize their return on investment even further.

60. Advertisers can buy ads using a variety of payment formats. Commonly, advertisers pay when an ad is viewed by a consumer, which creates what is known as an "impression." Payments for impressions typically fall under one of these models:

- Cost-per-mille (CPM) model: based on a cost per one thousand views;
- Cost-per-click (CPC) model: based on user interactions with the ad through clicks;
- Cost-per-action (CPA) model: based on when a user takes another specific action, such as signing up for a newsletter or making a purchase.

[18] In this context, video ads referred to are "outstream" video ads. "Instream" video ads are part of the relevant market.

4) Ad tech tool providers

61. Advertising technology, or ad tech, plays a fundamental role in the online display advertising industry. It comprises a set of products or tools that publishers and advertisers use to sell, buy, and transact impressions for open web display advertising.

62. As I explain when I consider market definition, the relevant ad tech tools include:

- publisher ad servers – tools that help publishers track, manage and sell their inventory in an automated fashion and maximize their yield
- ad exchanges – software products that enable the programmatic trading of impressions through auctions by connecting ad buyers and ad sellers
- ad buying tools – software products that enable the purchase of ad inventory based on the ad campaign budget and goals, and connect to ad exchanges and to sellers

63. Google is vertically integrated across all relevant product markets that I define below.[19] Google provides the DFP ad server, AdX ad exchange, Google Ads ad buying tool for small advertisers, and DV360 ad buying tool for large advertisers. This integration uniquely positions Google to leverage market power across these markets. In addition, Google offers AdMob for in-app publishers.

64. Google launched its search engine in 1998. It monetized its search engine by selling ads via its AdWords product.[20] Advertisers used AdWords to push their ads higher up on the search engine results page.[21] AdWords was renamed Google Ads.[22]

[19] With the acquisition of Xandr, Microsoft is now also integrated across several relevant product markets. As I show in Section V, Microsoft remains small in the relevant market.

[20] Google. "Google Launched Self-Service Advertising Program" (October 23, 2000). Accessed on April 29, 2024. https://googlepress.blogspot.com/2000/10/google-launches-self-service.html ("Google Inc. developer of the award-winning Google search engine, today announced the immediate availability of AdWords™, a new program that enables any advertiser to purchase individualized and affordable keyword advertising that appears instantly on the google.com search results page […] Google was founded by Stanford doctoral students Larry Page and Sergey Brin in 1998")

[21] Google. "Google Launched Self-Service Advertising Program" (October 23, 2000). Accessed on April 29, 2024. https://googlepress.blogspot.com/2000/10/google-launches-self-service.html ("Google's premium sponsorship ads will continue to appear at the top of the search results page")

[22] Google often internally refers to its ad buying tool for small advertisers, "Google Ads," as "GDN," "Google Display Network," or "AdWords." I will refer to Google's ad buying tool for small advertisers using these terms interchangeably throughout the report unless described otherwise in cited documents. *See for e.g.,* GOOG-NE-11914822 at -824. "Ads Overview: Ads SRE Noogler training" (October 17, 2018). Internal Google presentation introducing the ad industry and Google ad products. ("Google Ads (formerly AdWords).")

65. In 2003, Google began acquiring display advertising technology.[23,24] Ad tech enables the transaction to what is referred to as programmatic advertising, which permits the automated bidding and placement of ads. Google entered ad tech through its acquisition of Applied Semantics, which Google re-branded into AdSense.[25,26] Today, AdSense is part of Google's publisher ad server.

66. In 2008, Google paid $3.1B to acquire DoubleClick.[27] The acquisition included the publisher ad server, DoubleClick for Publishers (DFP), and an incipient ad exchange.[28] DFP managed access and routing of publishers' impressions to exchanges and advertisers. Later in the report, I explain why the acquisition of DoubleClick was one of Google's most significant acquisitions in ad tech.

67. Google continued acquiring ad tech businesses throughout the early 2010s. Acquisitions included the following:

- AdMob, a tool for app developers to monetize their properties through in-app ads,[29]

---

[23] Ad tech stack is an umbrella term which stands for advertising technology stack and refers to the set of ad tech tools used in the online display advertising.
AdButler. "What is AdTech? Basics of the Ad Tech Ecosystem Explained" (May 5, 2021). Accessed on April 29, 2024. https://www.adbutler.com/blog/article/what -is-ad-tech-the-ad-tech-ecosystem-explained#:~:text=The%20assembly%20of%20an%20%E2%80%9Cad%20tech%20stack%E2%80%9D%20refers,used%20to%20accomplish%20objectives%20within%20the%20advertising%20ecosystem; ("[…] shorthand for 'advertising technology'. It refers broadly to the software, systems, platforms, and ad tech tools used by publishers, advertisers, and other parties to buy, sell, and manage digital advertising")
[24] The New York Times. "Google Timeline" (April 9, 2004). Accessed on April 29, 2024. https://www.nytimes.com/2004/04/29/business/google-timeline.html ("March-April 2003 - The company announces its content-targeted advertising program and the acquisition of Applied Semantics")
[25] Digiday. "Today in History: Google Buys Applied Semantics" (April 23, 2013). Accessed on April 29, 2024. https://digiday.com/media/today-in-history-google-buys-applied-semantics/ ("The acquisition, which was for $102 million in cash and stock […] Google used Applied Semantics to improve its contextual targeting reach")
[26] Google. "Google Expands Advertising Monetization Program for Websites" (June 18, 2003). Accessed on April 29, 2024. https://googlepress.blogspot.com/2003/06/google-expands-advertising-monetization.html ("Google, developed of the award-winning Google search engine, today announced a new self-service option for Google AdSense, a program that enables website publishers to service ads precisely targeted to the specific content of their individual web pages.")
[27] The Seattle Times. "Google finally acquires DoubleClick" (March 12, 2008). Accessed on April 29, 2024. https://www.seattletimes.com/business/google-finally-acquires-doubleclick/ ("Google's long anticipated acquisition of online ad service DoubleClick […] The $3.1 billion deal […]")
[28] The New York Times,. "Google Buys DoubleClick for $3.1 Billion" (April 14, 2007). Accessed on April 29, 2024. https://www.nytimes.com/2007/04/14/technology/14DoubleClick.html ("The sale offers Google access to DoubleClick's advertisement software and, more importantly, its relationships with Web publishers, advertisers and advertising agencies"); DoubleClick launched its exchange in 2007. *See* DoubleClick. "DoubleClick Advertising Exchange." (October 18, 2007). Accessed on April 17, 2024. https://web.archive.org/web/20071001100309200710180156 01/http:/www.doubleclick.com/products/advertisingexchange/index.aspxinsight/pdfs/dc_adxoverview_0704.pdf
[29] AdMob. "Google to Acquire AdMob" (November 9, 2009). Accessed on April 29, 2024. https://web.archive.org/web/20091112010903/http:/blog.admob.com/2009/11/09/google-to-acquire-admob/ ("This morning we announced that AdMob has signed a definitive agreement to be acquired by Google"); *See also,* Google AdMob. "What is AdMob." (undated). Accessed January 19, 2024. https://admob.google.com/home/resources/what -is-admob/#:~:text=Google%20AdMob%20makes%20it%20easy%20for%20developers%20to,innovative%20ad%20formats%2C%20and%20advanced%20app%20monetization%20technology. ("Google AdMob makes it easy for developers to earn money from their mobile apps with high-quality ads. AdMob maximizes the value of every impression by combining global advertiser demand, innovative ad formats, and advanced app monetization technology.")

- Invite Media, a tool for large advertisers, now DV360,[30]

- AdMeld, a yield optimization technology, [31] and

- Adometry, an advertising analytics tool.[32]

B. Advertising Channels

1) Offline advertising channels

68. While advertising as a concept can be traced back to ancient civilizations, the invention of the printing press facilitated early forms of print advertising, with ads appearing in newspapers frequently by the 18th century and the introduction of billboard advertisements by the early 19th century (as people started travelling more frequently by car). Advertising also developed as a distinct business at this stage, with advertising agencies emerging as early as the late 18th century. Modern advertising has evolved at a rapid pace since the 20th century, with advances in technology, such as the radio and, subsequently, television, allowing for new forms of advertising. These forms of marketing allowed companies to use catchy jingles and visuals, celebrity endorsements, product demonstrations and infomercials, and more, to engage with potential customers.

69. Before programmatic online advertising, ads were delivered to various media outlets via representatives who sold and re-sold newspaper advertising space with a markup, but eventually advertising agencies evolved and started providing a wider range of services including planning, creating, and executing campaigns for their customers.

70. Common forms of offline marketing include:[33]

- Print media, such as newspapers, magazines, brochures and other printed materials

[30] Google Blog. "Investing in Exchange Bidding" (June 3, 2010). Accessed on April 29, 2024. https://doubleclick-advertisers.googleblog.com/2010/06/investing-in-exchange-bidding.html ("We're happy to announce that we've acquired Invite Media, an innovative start-up based in New York and Philadelphia. The team at Invite Media has developed technology that enables advertisers and agencies to use 'real time bidding' to buy display ad space, and to optimize display ad campaigns, across multiple advertising exchanges, all in a single interface.")
[31] The Washington Post. "Justice Dept. approves Google's AdMeld acquisition" (December 2, 2011). Accessed on June 6, 2024. https://www.washingtonpost.com/business/economy/source-justice-will-approve-googles-admeld-acquisition/2011/12/02/gIQAH8cyKO_story.html ("The Justice Department on Friday gave the green light to Google's $400 million acquisition of AdMeld, a major display advertising company.")
[32] TechCrunch. "Google Acquires Adometry To Bring More Attribution To Google Analytics" (May 6, 2014). Accessed on April 29, 2024. https://techcrunch.com/2014/05/06/google-acquires-adometry/ ("Google just announced that it has acquired ad attribution company Adometry")

- Outdoor advertising, such as billboards, posters and banners placed in public areas
- Event marketing, such as trade shows or sponsoring events
- Direct mail, which involves sending promotional materials like catalogs directly via mail to potential customers
- Broadcast media, which involves radio and television advertisements

71. In this report, I will use "advertisers" as a general term for market participants who purchase advertisements.

2) Online advertising channels

72. With the rise of the Internet in the 1990s, user attention shifted to online media. Advertisers began buying ads online to reach their target customers. Online advertising enabled advertisers to target their consumers more and track precisely the impact of their campaigns. Unlike displaying an ad on a billboard, advertisers could potentially get more precise data on many metrics such as how many users saw their ads, the profile of these users, the conversion rate, the return on investment (ROI) of the campaign.

73. With the development of the Internet, advertising transitioned from hard copy publications, such as newspapers and magazines, to online advertising. Online advertising originally focused on the display of ads on websites. As mobile devices became popular and as social media emerged, other types of online advertising started to sprout. These distinct types of online advertising include display, search, social media, in-stream video, and in-app advertising.

74. Each type of advertising enables distinct targeting of potential users. Advertisers seek inventory that best aligns their campaign goals with their campaign budget. Advertisers choose a specific ad type or types to match the goal of a particular ad campaign. Each ad type fulfils distinct campaign goals and takes place at different stages of the marketing funnel.[34]

[34] The Interactive Advertising Bureau (IAB) recognizes the existence and role of different types of advertising. It defines display ads as a category of online advertising. In particular, it distinguishes display ads from video ads appearing in video players, e.g., Youtube. *See,* IAB. "Internet Advertising Revenue Report: Full-year 2022 results" pg. 22 (April 2023). https://www.iab.com/wp-content/uploads/2023/04/IAB_PwC_Internet_Advertising_Revenue_Report_2022.pdf

75. I understand that the marketing funnel is a conceptual framework that is used by advertisers and academics to understand the customer's journey from product awareness to purchase decision. Most frameworks outline the following stages:[35]

- Awareness: At the top of the funnel (i.e., at the beginning of their customer journey), consumers become aware of a brand and/or product e.g. they come across a display advert or a social media post.
- Interest: Consumers then show interest in a specific product or service and may search for more information e.g. visit the company's website.
- Consideration: During the consideration stage, consumers evaluate the product or service e.g. compare it with alternatives, read reviews, and weigh the benefits and features.
- Intent: At this stage, consumers have a strong intention to purchase. They may add the product to their cart on the website, sign up for a trial, request a quote, or other action.
- Purchase: The purchase stage is where the consumer makes the decision to buy the product or service.
- Post-purchase: The customer journey does not end with the purchase of the product. Returns, customer support, retention efforts are all part of the post-purchase stage.

76. Many advertisers use the marketing funnel to understand their customers and plan their marketing campaigns. An advertiser might launch simultaneous campaigns to reach distinct customers at the various stages of the marketing funnel. For instance, the same advertiser might simultaneously 1) launch a physical billboard or online display advertising campaign to raise awareness of its brand; 2) launch a search advertising campaign on Google search for its customers in the interest and consideration stages. Over time, the goal of an advertiser is to push its potential customers down the funnel through the appropriate advertising campaigns and distinct ad types.

77. Different ad types are non-substitutable to display ads for advertisers, given they serve different purposes even when a brand's potential customers see different types of ads. Selecting the ad type(s) to purchase is the result of a multiple-stage decision process. Once an advertiser has selected an ad type, it must then choose an ad format. The further along in the ad space buying process an advertiser goes, the easier it is for the advertiser to make changes. Ad format choices (e.g. choosing between a banner display ad and a pop-up ad) are similar and, hence, substitutable compared to ad type choices (i.e. between

[35] Conversation with John Chandler, June 4th, 2024.

display ads and video ads).[36] This is reflected in the Google Ads interface, where the exact size of the ads is chosen at the last stage of a display ad campaign decision process before the ultimate review and submission step. Thus, different sizes of display ads (i.e. ad format choices) present less differentiation than choices made in an earlier step (i.e. ad type choices). Advertisers need to pick if the campaign is going to utilize display ads or video ads during the very first step of their purchase decision. Hence, it can be inferred that there is relatively low substitutability between display ads and video ads; both require investment in developing the particular ad format for specific ads and ad campaigns.

78. Google internally refers to distinct types of inventories separately given their non-substitutability vis-a-vis advertiser campaign goals.[37] I note that Google internally makes a distinction between these main ad types, given their non-substitutability in terms of advertiser campaign goals.[38] In this section, I describe each of the five advertising types.

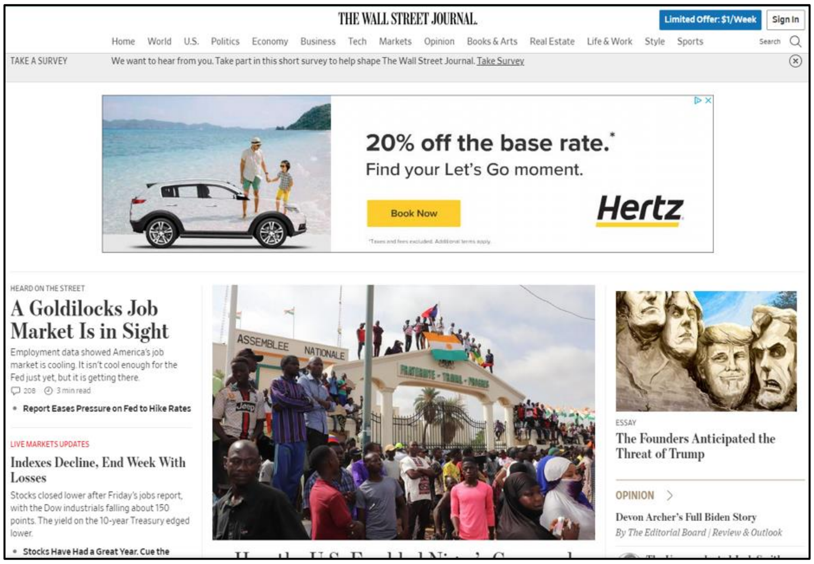
a) Online web display advertising

79. Open web display ads are a distinct type of online advertising appearing on content providers' or publishers' websites to reach a target user or audience.[39] Display advertising uses visuals, like graphics, text, video, to convey a message and/or promote a product/service. For example, the figure below depicts an online display ad for Hertz, a rental car agency, posted on The Wall Street Journal website. Online web display ads are served on websites based on the context of the website and the user viewing the website.

[36] Competition and Markets Authority. "Online platforms and digital advertising: Market study final report" para. 5.370 (July 1, 2020). https://assets.publishing.service.gov.uk/media/5efc57ed3a6f4023d242ed56/Final_report_1_July_2020_.pdf ("Advertisers use different forms of advertising for different, often complementary purposes. Search and display advertising serve distinct purposes, with only limited substitutability between them. There is also segmentation within display advertising between video and non-video advertising. Platforms that control a significant share of a particular type of advertising inventory are able to exercise a degree of market power over advertisers.")
According to paragraph 5.23 of the same report, "There is limited substitutability between search and display advertising", and between "video and non-video display advertising".
[37] GOOG-AT-MDL-001004706 at -713. "Ad Manager Ecosystem 101" (June 2019). Internal Google presentation introducing the ads ecosystem by gTech. (Internal slide distinguishing between inventory types)
[38] GOOG-DOJ-AT-00730932 at -947. "Discovery campaigns Social Buyer Insights" (March 2020). Internal Google presentation on advertisers. ("[…] [advertiser] won't completely turn a channel off as they want to diversify as much as possible. Diversification [across advertising types] is perceived as essential to mitigate risks associated with being tied to one platform (E.G. losing control to Facebook or Google) […] Advertisers also perceive a diminishing returns if they focus only on a few channels.")
[39] Throughout this report I will refer to content providers who want to place content online and sell ads associated with that content as "publishers."

Figure 1

Online display ad for Hertz posted on the Wall Street Journal website[40]



80. Advertisers use display advertising to drive brand awareness.[41] The eye-catching nature of online display ads helps draw a consumer's attention, increasing the likelihood of recall, even if just viewed for a moment.[42]

81. Brand awareness is the extent to which a consumer is familiar with and recognizes a particular brand. It measures how well a brand is known; high brand awareness means the brand is easily remembered and associated with a particular product or service. Brand awareness can be built through various advertising efforts and specific ad types.[43] For example, billboards, display ads in newspapers, and online display ads are commonly used to grow brand awareness.

---

[40] Screenshot from The Wall Street Journal website. Search query "The Wall Street Journal," performed on a Google Chrome web browser.

[41] Microsoft Advertising. "How to build brand awareness with display advertising." (undated). Accessed on April 29, 2024. https://about.ads.microsoft.com/en-us/get-started/brand-awareness-display-ads ("Thanks to their ability to reach a targeted demographic, display ads are a great way to build brand awareness [...] Putting the ad in front of your target audience familiarizes them with your brand and product, increasing search ad conversion and leading to organic traffic in the future.")

[42] Qualtrics. "What is brand recall and why is it important?" (undated). Accessed on April 29, 2024. https://www.qualtrics.com/experience-management/brand/brand-recall/ ("Positive brand recall can be inspired by many factors. Advertising exposure […] there are ways to get your brand into the minds of potential customers […] To promote brand recall in your customers, you might want to focus on: […] Developing an eye-catching logo or branding style")

[43] Amazon Ads. "Brand awareness" (undated). Accessed on May 1, 2024. https://advertising.amazon.com/en-gb/library/guides/brand-awareness ("Brand awareness, or brand recognition, refers to a customer's level of familiarity with a product or service by name […] Ever wonder why you recognise, remember and have an association with a company, even if you don't use their products? It's because they have strong brand awareness, which means consumers are familiar with, or aware of, their brands [...] Companies can help increase brand awareness through promotions, social media, influencer programmes and, of course, brand advertising.")

82. Advertisers also use display advertising to drive conversions. Given display ads are clickable, a consumer who clicks on the ad can continue to evaluate the ad and move a step closer to completing the advertiser's intended conversion goal, whether that be a purchase, sign-up, or some other outcome.

b) Search advertising

83. Paid search, or pay-per-click (PPC) advertising is a form of advertising that displays ads in search-engine results whenever someone searches for specific keywords relating to the products offered by the advertiser. Therefore, this form of advertising can be very effective, as it is based on the explicit preferences of users, rather than just implicit information on what they might potentially be interested in.[44,45]

84. Whenever a user searches for a product or service online, Google (or any other search-engine such as Bing or Yahoo) provides a results page with both organic (free listing relevant to the search terms) and sponsored results, where the sponsored results clearly labelled as such. These sponsored results are typically displayed as the top few results and some at the bottom of the page, and when a user clicks on a sponsored result, the advertiser is charged for that click.

c) Social media advertising

85. Social media advertising involves running paid advertisements on social media platforms (for example Facebook, Instagram and Twitter), and can be targeted to a subset of users based on demographics, user behavior and the behavior/preferences of other users with similar characteristics. They can also be targeted based on information that comes from a user's social graph (i.e., their friends, connections, follows and interactions with respect to content on those networks), which gives advertisers a distinct set of targeting opportunities available within the walled gardens of those networks. The format of these ads can vary from videos and photos, to carousel ads (ads that appear between posts while the user is scrolling through their feed), and ads on stories (videos that appear on user accounts for 24 hours),

---

[44] ClearCode. "What Is Search Advertising and How Does It Work?" (January 30, 2024). Accessed on May 1, 2024. https://clearcode.cc/blog/what -is-search-advertising/ ("Paid search advertising (also known as sponsored ads, search marketing, search-engine marketing, pay-per-click marketing, and cost-per-click marketing) is a technique that displays ads in search-engine results whenever someone searches for the services or products offered by the advertiser. In this way, the ad displayed perfectly matches each query […] It offers excellent results for specific industries, where may be more effective than the use of traditional "spray-and-pray" ads.")

[45] Google Ads. "What is paid search?" (March 20, 2023). Accessed on May 1, 2024. https://ads.google.com/intl/en_au/home/resources/articles/what -is-paid-search/ ("Picking the right keywords helps you to target the right audience. This, in turn, leads to higher click-through rates […] When you type something into Google, you're presented with a list of results on the Search Engine Results Page (SERP). Here, you see both organic results and paid results.")

and to some extent depend on the user interface of the social media platform in question; for example, not all platforms feature stories.

86. Aside from social networks such as Facebook, people also use platforms such as YouTube and TikTok primarily for media sharing purposes. They feature influencers i.e., popular users who use their social platforms to influence their audience's lifestyles and consumer behavior. Advertisers can also partner with specific influencers with a relevant target audience for the advertiser, to promote their products on the influencers' pages.[46]

87. Social media has made is possible for advertisers to reach customers at different stages of their consumer decision journey, from brand awareness, to post-purchase, as social media is also used to channel complaints and customer service interactions.[47] However, for publishers on the open web, they do not have direct access and control over those advertisements and do not own ad space on social media networks.

d) In-app advertising

88. In-app advertising refers to the concept of displaying advertisements within a mobile application, allowing app owners to monetize their product and advertisers to show their ads to a relevant and engaged audience. Advertisers can target users based on demographics, location, time of day, device and operating system and user preferences and behavior, among other things.

89. These types of ads can follow various formats, such as banners, interstitial ads, video ads, native ads, and rich-media ads. In addition, some ads for games can be made playable, allowing the user to play a short demo of the game before downloading it. Apps may also contain rewarded ads, where users voluntarily watch ads to receive benefits such as extra lives or in-app coins.

e) In-stream video advertising

90. In-stream ads are videos that play before, during, or after other videos on media-sharing platforms such as YouTube.

---

[46] McKinsey. "What is social media?" (June 8, 2023). Accessed on May 1, 2024. https://www.mckinsey.com/featured-insights/mckinsey-explainers/what -is-social-media ("Media-sharing platforms are the domain of social-media influencers: popular users who use their social platforms to influence their audience's lifestyles, consumer behavior, and more. Through partnerships with these influencers, businesses can target specific audiences and promote their products or services.")
[47] McKinsey. "What is social media?" (June 8, 2023). Accessed on May 1, 2024. https://www.mckinsey.com/featured-insights/mckinsey-explainers/what -is-social-media ("The most powerful social-media strategies focus on a limited number of marketing responses closely related to every stage along the consumer decision journey […] Companies should cater their tone, customer service, and advertisements to each platform's users […] customers expect quick responses to their online questions and complaints.")

91. In-stream video ads are distinct from out-stream video ads. While in-stream video ads are video ads placed within video content the user is watching, out-stream video ads are video ads placed next to the content the user is looking at. Google explains: "[…] instream (similar to youtube watch page) slot have high view rate, while outstream have lower view rate. It has different a issue since for outstream, user can scroll pass the ad slot where video does not have a chance to play."48 In-stream video are used by advertisers to reach a more attentive audience, while out-stream video are used to reach a broader, but less engaged, audience.

92. In-stream video ads are specifically tailored for mobile and desktop, and are distinct from television ads. The advertiser can choose the length (typically 15-30 seconds) and whether or not the user has the option to skip the ad.[49]

C. Industry Description

93. Delving further into online display advertising, publishers and advertisers are the key players in the scale of ad inventory. Publishers sell their space on websites to support display ads are on the sell-side of this transaction. Advertisers representing brands buying space on publishers' websites are on the buy-side.[50] Online display ads are targeted for specific websites based on the context of the website and the characteristics of the user viewing the website. The process through which ads appear on websites follows a standard flow of events. First, a user visits a publisher's website. That website visit triggers a digital response from specific slots on the website publishers want to sell to hold ads. That ad request is sent to the publisher's ad server. The ad request contains data about the visitor, such as their location, device type and potentially richer information.[51] The data the publisher has on visitors is collected through several methods, including cookies.

[48] GOOG-AT-MDL-000034633 at -634. "Re: pView view rate distribution?" (August 24, 2020). Internal email thread between [redacted], [redacted], and others.
[49] Google Ads Help. "Aboud video ad formats" (undated). Accessed on May 1, 2024. https://support.google.com/google-ads/answer/2375464?hl=en#nonskippable-instream ("Non-skippable in-stream ads are 30 seconds or shorter, and play before, during, or after other videos. Viewers don't have the option to skip the ad.")
[50] ClearCode. "The Main Technology Platforms and Intermediaries in the Digital Advertising Ecosystem" (undated). Accessed on April 29, 2024. https://adtechbook.clearcode.cc/adtech-platforms-and-intermediaries/ ("Advertisers (brands) represent the buy side, as they are the ones wanting to buy online media (aka ad space or inventory) […] Publishers (websites and apps) represent the sell side, as they are the ones wanting to sell the ad space to media buyers.")
[51] ClearCode. "Media-Buying Methods: Programmatic, Real-Time Bidding (RTB), Header Bidding, and PM" (undated). Accessed on April 29, 2024. https://adtechbook.clearcode.cc/media-buying-methods/ ("RTB allows advertisers to purchase individual impressions across multiple publishers to reach their target audience more precisely and bid based on the information known about the website and user at that particular time […] Below is a detailed illustration and description of how the RTB ad exchange works. A user visits a page (example.com). The page contains an ad slot with JavaScript code that requests content from the first-party ad server, known as an ad request. The request also passes additional data about the user, such as their location, device type and operating system […] The DSP's ad server sends the creative to the browser and the ad displays to the user.")

94. Based on the information in the ad request, including data on the website's visitors, the publisher ad server uses "inventory routing logic"[52] to determine whether to serve a programmatic direct ad or request an ad through another demand source.[53]

95. Publishers' ad servers have used different decision processes over time. In the early days of online display advertising, the most widely used routing logic was the Waterfall process. The Waterfall designated the process for selling publishers' space, in which potential advertisers, or demand sources, are called sequentially, one at a time, to submit bids.[54] Today, the Waterfall is no longer the default routing logic.

96. In the Waterfall setup, if the publisher's ad server called an exchange through its inventory routing logic, the ad exchange requested bids from potential advertisers as sources on the demand-side (including via ad buying tools such as "Demand-Side Platforms" (DSPs), and ad networks). This bid request included some details on the identity of website visitors and other parameters potential advertisers used in determining whether to bid and what to bid.[55] The details included a floor price, representing the minimum price necessary to win the bid, the ad format, the website URL, and the hashed user identifier.

97. The demand sources evaluate the bid request and decide whether to submit a bid and the bid amount based on their targeting parameters and criteria. They then send a bid response to the exchange, including their bid value and a piece of code allowing an ad creative to be displayed in an ad slot.[56,57] The ad exchange reviews all the bids it receives from the demand sources and runs an auction. The exchange runs its auction logic and selects a winner. Auctions in programmatic advertising are often sealed first-

---

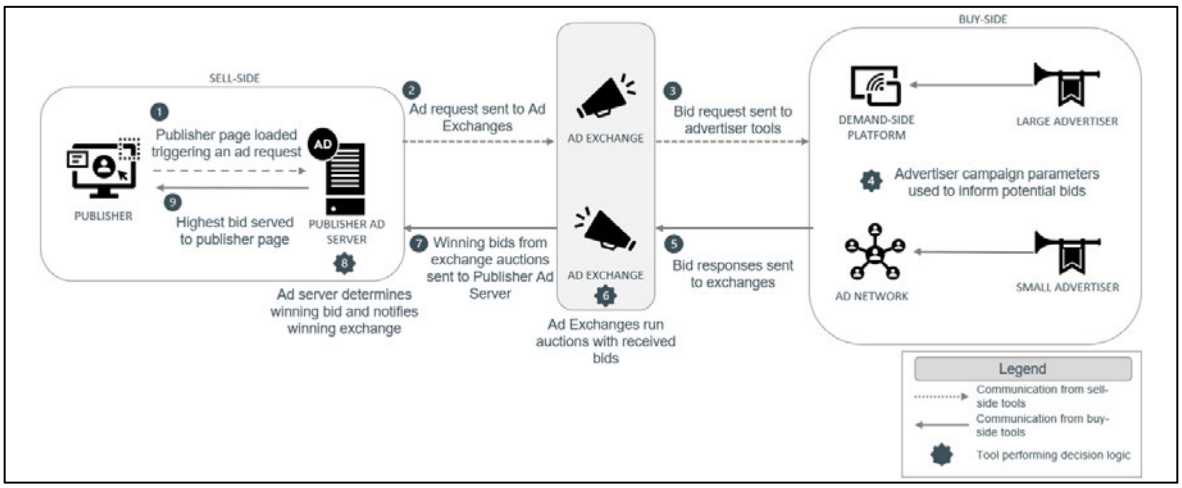
[52] GOOG-AT-MDL-001446407 at -411. "Maximize your earnings with Google Ad Manager" (September 9, 2020, *per metadata*). Internal Google presentation describing key features of GAM. (Document describes the GAM ad serving process as follows: "Website/app gives Ad Manager a list of criteria about which ads would be suitable to fill empty ad slots on the page. […] This is based on criteria such as the size of the ad slot on the page, the date and time of day, and the geographic location of the user."); *See also,* GOOG-AT-MDL-001446407 at -416. "Maximize your earnings with Google Ad Manager" (September 9, 2020, *per metadata*). Internal Google presentation describing key features of GAM. ("With Google Ad Manager, we provide a single UI for all deal types. That has allowed us to become the market leader in this transition since we support all deal types from traditional reservations through programmatic direct to open auction.")
[53] As it will become clear in the report, the ad server plays a key role in the decision logic of the ad serving.
[54] ClearCode. "What is Waterfalling and How Does it Work?" (September 1, 2016). Accessed on April 29, 2024. https://clearcode.cc/blog/what -is-waterfalling/ ("Waterfalling, also known as a daisy chain or waterfall tags, is a process used by a publisher to sell all remnant inventory […] Waterfalling gets its name from the waterfall-like process for selling inventory — i.e. the demand sources are initiated one at a time, one after another.").
[55] Clearcode. "Media-Buying Methods: Programmatic, Real-Time Bidding (RTB), Header Bidding, and PMP" (undated). Accessed on April 29, 2024. https://adtechbook.clearcode.cc/media-buying-methods/ ("The request also passes additional data about the user, such as their location, device type and operating system.")
[56] A creative is the ad served to users on a webpage, app, or other digital environment. Creatives can be images, video, audio, and other formats that get delivered to users. *See* Google Ad Manager Help. "What are creatives?" (undated). Accessed on May 1, 2024. https://support.google.com/admanager/answer/3185155?hl=en
[57] The code which allows an ad creative to be displayed on a page is called "ad markup" *See* AdButler. "AdTech Glossary: Digital Advertising Terms & Jargon to Know" (July 1, 2021). Accessed on May 2, 2024. https://www.adbutler.com/blog/article/ad-tech-glossary-digital-advertising-terms-jargon-to-know

price or second-price auctions.[58] The winning bid of the auction is then relayed back to the publisher ad server.

98. The publisher ad server receives different winning bids from several exchanges. The publisher ad server determines the final winning bid amongst those it received and notifies the winning ad exchange. The ad exchange, in response, sends the final price to the winning advertiser (or demand source)[59] who, in turn, sends the ad markup to display to the specific website visitor. A diagram of the information flow and decision logic in the programmatic ad tech ecosystem is provided below in Figure 2.

Figure 2

Information flow and decision-logic in the programmatic ad tech ecosystem



99. This description provides a general understanding of the flow of events along an online display ad transaction. As I will explain in the following section, the ad tech stack evolved throughout the years as new publishers' and advertisers' needs emerged. Ad tech tools have gained sophistication, new tools have developed, and some tools have become obsolete or used less frequently. More importantly, the auction logic, which provides the rules by which publisher inventory is awarded to bidders, underwent several changes.

[58] ClearCode. "How Do First-Price and Second-Price Auctions Work in Online Advertising?" (May 15, 2024). Accessed on June 4, 2024. https://clearcode.cc/blog/first-price-second-price-auction/ ("The second-price auction model is widely applied in the world of programmatic. For years, it has allowed advertisers to bid high prices to secure impressions, but ultimately pay a much lower price. However, due to recent trends in the AdTech industry, we are witnessing a steady transition to a model similar to the first-price auction."). A sealed auction is an auction in which all bidders submit their bids simultaneously and in which each bid is only known by the bidder that submitted it. In a first-price auction, bidders bid simultaneously, and the highest bidder wins and pays the value of its bid. In a second-price auction, bidders bid simultaneously, and the highest bidder wins and pays the value of the second-highest bid.
[59] The final price can vary from the bid the demand-source submitted if the exchange runs a second-price auction.

D. Evolution of Online Display Advertising

1) Online web display advertising in the early 1990s

100. Initially, online advertising used a direct sales model similar to the model used in traditional, offline ad buying. Direct sales are the direct negotiation and transaction of ads between publishers and advertisers. Direct sales were a manual process in which advertisers had to search for publishers and negotiate the terms of the deal. They then signed a contract called an Insertion Order and exchanged a set of tags, i.e. pieces of code, that publishers could insert into an ad tech tool called publisher ad server, which enabled them to serve the creatives on their websites.

101. While these deals enabled the development of a relationship between advertisers and publishers and guaranteed tailored agreements, they proved inefficient, requiring significant human, financial, and time investments. A Boston Consulting Group study summarized the inefficiencies resulting from the traditional direct sales process.[60] These inefficiencies include the following:

a. manual processes (data reentry, resolving discrepancies between reports or invoices)

b. campaign rework (human error from multiple handovers, readjusting inventory forecasts, internal and external duplication)

c. over-processing (campaign-by-campaign pricing negotiation, delivery verification)

d. media waste (wasted impressions, unsold inventory)

e. human capital (highly skilled individuals doing low-value tasks, suboptimal split between sales and operations)

f. wait time (waiting for creative, multiple handovers, campaign start date delayed)

g. transport (in-person negotiations and end-of-campaign reports), and

h. inventory (inventory creation is not linked to demand, and backlogs of campaigns are not yet live).

[60] Boston Consulting Group. "A Guaranteed Opportunity in Programmatic Advertising" (February 7, 2018). Accessed on May 2, 2024. https://www.bcg.com/publications/2018/guaranteed-opportunity-programmatic-advertising. Further information is provided in the Exhibit 3 visual representation of the "Eight Categories of Waste in the Traditional Direct Reservations Process."

2) In the mid-1990s, as online advertising grew, publisher ad servers emerged as technical intermediaries

102. As the Internet developed, and more visitors viewed more websites, the number of spaces available for advertisements on publisher's websites grew.[61] The increased volume of visits from a larger and more diverse audience created an opportunity for publishers to find a more dynamic way to sell display advertising space on their properties.[62] Publisher ad servers were developed to enable the management and selling of that growing inventory of slots on publishers' websites.

103. The first publisher ad server was introduced in 1996 as one of the first components of the ad tech stack.[63] Publisher ad servers serve as the decision engine, controlling what ads appear on the publisher's website. At the time, publisher ad servers stored ads and served them directly to website visitors based on targeting parameters, such as user location, time of day, and user interests.[64] In Section V.C.1, I show Google's share of the publisher ad server market over time through various metrics, including penetration.

104. In the mid-1990s, as online advertising grew, advertiser, or buy-side, ad servers emerged as technical intermediaries. For advertisers seeking to buy space on publishers' websites, transacting directly with each publisher became increasingly costly. In response, advertiser ad servers emerged in the mid-1990s to streamline the purchasing of ad inventory.[65] Advertiser ad servers emerged as a piece of ad tech used to host, manage and distribute ads, enabling advertisers to manage and store creatives. One type of advertiser ad server, called an ad network, aggregated groups of small advertisers. Many networks emerged between 2003 and 2008, a period that Google refers to as "the age of the ad network."[66] As pools

[61] Impressions refer to an ad that is viewed by a user. A user being exposed to one ad once represents one impression.
[62] ClearCode. "What is an Ad Server and How Does it Work?" (March 12, 2024). Accessed on May 2, 2024. https://clearcode.cc/blog/what -is-an-ad-server/ ("When the popularity of the Internet started to take off in the early to mid 1990s, traditional print publishers began moving online […] Publishers soon discovered they needed a more efficient and easier way to manage their the various advertisers' campaigns that ran on their website. It was here that the first-party (aka publisher's ad server) was born.")
[63] AdButler. "Ad Networks vs Ad Exchanges: The History of Programmatic Advertising" (March 15, 2021). Accessed on May 2, 2024. https://www.adbutler.com/blog/article/ad-networks-vs-ad-exchanges-the-history-of-programmatic-advertising#Enter-Ad-Servers---1995-/-1996. (The first ad server was called Net Gravity. The article also notes that the first display ad was an ad for AT&T posted across the top of HotWired.com's homepage in 1994.)
[64] AdButler. "Ad Networks vs Ad Exchanges: The History of Programmatic Advertising" (March 15, 2021). Accessed on May 2, 2024. https://www.adbutler.com/blog/article/ad-networks-vs-ad-exchanges-the-history-of-programmatic-advertising#Enter-Ad-Servers---1995-/-1996 ("Define ad serving rules through ad targeting options […] Contextual (placing ads based on semantically related keywords) Geographic (serving certain ads to users based on their location) Dayparting (scheduling certain ads to display on different days / times) Behavioral (users who have demonstrated interest in similar niche websites)")
[65] ClearCode. "The History of Digital Advertising Technology" (undated) Accessed on May 2, 2024. https://adtechbook.clearcode.cc/history-advertising-technology/ ("The first ad servers began popping up in 1995 and initially were used to control the delivery and management of online ads.")
[66] GOOG-AT-MDL-B-001060629 at -629. "Header Bidding Working Group" (May 2016). Internal Google document describing the current state of Header Bidding.

of small advertisers, ad networks, were particularly adept at purchasing publishers' "remnant" inventory (i.e., slots on websites for display that would have previously gone unsold).[67]

3) Ad exchanges emerged as a technical intermediary product connecting publisher supply with advertiser demand

105. In the early 2000s, shortly after publisher and advertiser-side servers were developed, ad exchanges emerged as a junction between the sell-side and the buy-side. Unlike ad networks, which only enabled publishers and advertisers to transact inventory in bulk, ad exchanges enabled the transaction of ad inventory on an individual impression level. DoubleClick's exchange announcement explained that exchanges are "an impression-by-impression auction marketplace."[68]

106. With the rise of ad exchanges, online inventory became more easily transactable.[69] When a publisher had inventory to sell, the publisher's ad server could share the details of the inventory with the ad exchange instead of selling through an ad network. The ad exchange ran an auction to sell ad inventory to the highest bid among the demand sources, including ad networks.

107. In the Waterfall process, demand partners were ranked sequentially based on their average historical yield rather than based on the impression value. When a publisher had an impression to sell, the publisher ad server would call each demand partner sequentially, from highest to lowest historical yield, and select the first demand partner with a bid at or above the minimum bid requested by the publisher. This meant that the Waterfall set-up disregarded potential higher bids from other demand partners further down the list. Demand sources did not compete head-to-head, and the Waterfall system did not maximize yields for publishers. Demand partners with little bid history therefore had a low chance of winning the impression.

108. As AppNexus[70] explains: "That static value determines the order in which those partners are offered impressions. But since programmatic buyers produce a different bid for every impression, there's

---

[67] Remnant inventory designates unsold inventory.
[68] DoubleClick. "DoubleClick Advertising Exchange" (undated). Accessed on April 17, 2024. https://web.archive.org/web/20071001100309/http:/www.doubleclick.com/products/advertisingexchange/index.aspx
[69] Google User Content. "The Arrival of Real-Time Bidding and What it Means for Media Buyers" (July 2011). Accessed on May 2, 2024. https://web.archive.org/web/20120130062954/http:/static.googleusercontent.com/external_content/untrusted_dlcp/www.google.com/en/us/doubleclick/pdfs/Google-White-Paper-The-Arrival-of-Real-Time-Bidding-July-2011.pdf ("When ad exchanges opened, they brought more liquidity to the marketplace for online inventory. 2007 was a pivotal year for ad exchanges […] made vast pools of inventory available, which greatly improved the experience for many parties to transact in online display.")
[70] AppNexus operates an ad exchange business. *See,* The Wall Street Journal. "What is AppNexus? We explain What the Ad Tech Company Does" (December 1, 2016). Accessed on May 2, 2024. https://www.wsj.com/articles/what -is-appnexus-we-explain-what -the-ad-tech-company-does-1480632208.

no way of knowing whether the first partner in the waterfall is actually the one prepared to offer the highest bid. In many instances, this has caused publishers to sell impressions at a lower price than what a partner further down the waterfall would have been willing to pay. Every time this happens, publishers lose revenue that should have been theirs."[71] The Waterfall process thus had obvious flaws. As explained by AppNexus, "The waterfall was leaking money with every new auction. Publishers needed something better."[72]

4) New technologies emerged, enabling publishers and advertisers to optimize inventory transactions

109. Around 2007, "Supply-Side Platforms" (SSPs) were created "to manage all of the back office on behalf of publishers."[73] SSPs allowed publishers to sell their inventory and optimize ad inventory sales via parameters like bid floors and ad frequency caps, among others. These types of ad tech tools were later integrated into publisher ad servers and ad exchanges as part of these tools' inventory routing logic.

110. Similarly, on the buy-side, starting in 2008, some ad networks pivoted to become more like ad buying tools.[74] These terms are sometimes used interchangeably. Some ad-buying tools, called DSPs, enable advertisers to set parameters, like maximum bid price, to programmatically (i.e., automatically) buy individual impressions. Advertisers can benefit from the expertise of an ad network that selects optimal ad inventory and bears the responsibility of meeting the advertiser's campaign goals. A DSP, however, places that responsibility on the advertiser and larger and more sophisticated advertisers may prefer having that control. DSPs are usually referred to as ad buying tools for large advertisers. Advertisers with a limited advertising budget, who may find it difficult to win bids for an ad space through the ad exchange, can utilize ad buying tools for small advertisers to connect with publishers who can reach the advertiser's target audience.

111. Real-time bidding (RTB) emerged as a solution to the sequencing issues posed by the Waterfall process, enabling advertisers to take advantage of this new liquidity and scale their advertising

[71] AppNexus. "Header Bidding: The Next Evolution" (2017). Accessed on May 2, 2024. https://www.appnexus.com/sites/default/files/whitepapers/header-bidding-2017.pdf
[72] AppNexus. "Header Bidding: The Next Evolution" (2017). Accessed on May 2, 2024. https://www.appnexus.com/sites/default/files/whitepapers/header-bidding-2017.pdf
[73] GOOG-TEX-00896446 at -446. "Header Bidding Working Group Tentative Document Structure" (May 2016). Internal Google document to develop a thorough, research-based review of the current state of Header Bidding.
[74] GOOG-TEX-00896446 at -447. "Header Bidding Working Group Tentative Document Structure" (May 2016). Internal Google document to develop a thorough, research-based review of the current state of Header Bidding. ("Seemingly overnight, behavioral ad networks & traditional networks pivoted into Retargeters & DSPs.")

campaigns.[75] Ad exchanges introduced RTB to sell individual impressions the moment a user enters a publisher's webpage. Information about the user entering the website is provided in the auction, leading to improved ad targeting for advertisers. The entire real-time ad-serving process occurs within the time it takes for a webpage to load, about 100-150 milliseconds.[76] This loading time is usually not even noticed by the user, as ads appear almost at the same time as the webpage.

112. A wave of exchanges and sell-side platforms announced support for RTB between 2009 and 2010, with ad tech tools like AdBrite, AdMeld, OpenX, PubMatic, Adap.tw, AdJug, ContextWeb, and Rubicon publicly announcing RTB support.[77] Similarly, DoubleClick Ad Exchange announced RTB support in 2009.[78]

113. RTB provided benefits to advertisers, such as increased CPM rates and CTR (click-through rates) performance. As a consequence, RTB was quickly adopted. The percentage of spend via RTB on DoubleClick Ad Exchange grew from 8% in January 2010 to 64% a year later.[79]

114. Google enabled real-time bidding on its ad-serving tech through a feature that was part of its DoubleClick acquisition.[80] This feature, called Dynamic Allocation, allowed AdX to submit real-time

[75] Google User Content. "The Arrival of Real-Time Bidding and What it Means for Media Buyers" (July 2011). Accessed on May 2, 2024. https://web.archive.org/web/20120130062954/http:/static.googleusercontent.com/external_content/untrusted_dlcp/www.google.com/en/us/doubleclick/pdfs/Google-White-Paper-The-Arrival-of-Real-Time-Bidding-July-2011.pdf ("Real-time bidding helps media buyers find audiences at scale […] more liquidity to the marketplace")
[76] ClearCode. "Media-Buying Methods: Programmatic, real-time Bidding (RTB), header Bidding, and PMP" (undated). Accessed on April 29, 2024. https://adtechbook.clearcode.cc/media-buying-methods/ ("The request also passes additional data about the user, such as their location, device type and operating system [...] This entire process happens in real time when an ad is loaded onto the page, usually within 100–150 milliseconds.")
[77] Google User Content. "The Arrival of Real-Time Bidding and What it Means for Media Buyers" (July 2011). Accessed on May 2, 2024. https://web.archive.org/web/20120130062954/http:/static.googleusercontent.com/external_content/untrusted_dlcp/www.google.com/en/us/doubleclick/pdfs/Google-White-Paper-The-Arrival-of-Real-Time-Bidding-July-2011.pdf. The timeline is provided in Figure 2.
[78] Google User Content. "The Arrival of Real-Time Bidding and What it Means for Media Buyers" (July 2011). Accessed on May 2, 2024. https://web.archive.org/web/20120130062954/http:/static.googleusercontent.com/external_content/untrusted_dlcp/www.google.com/en/us/doubleclick/pdfs/Google-White-Paper-The-Arrival-of-Real-Time-Bidding-July-2011.pdf. The timeline is provided in Figure 2.
[79] Google User Content. "The Arrival of Real-Time Bidding and What it Means for Media Buyers" (July 2011). Accessed on May 2, 2024. https://web.archive.org/web/20120130062954/http:/static.googleusercontent.com/external_content/untrusted_dlcp/www.google.com/en/us/doubleclick/pdfs/Google-White-Paper-The-Arrival-of-Real-Time-Bidding-July-2011.pdf ("ADX inventory sold through RTB jumped from 8% in January 2010 to 68% in May 2011—a tremendous upswing in just under a year and a half").
[80] DoubleClick. "DoubleClick Advertising Exchange" (undated). Accessed on April 17, 2024. https://web.archive.org/web/20071001100309/http://www.doubleclick.com/products/advertisingexchange/index.aspx ("DoubleClick's proprietary Dynamic Allocation system sells inventory through the channel that pays the highest price, in real time.")

bids for inventory sold on DFP, while other industry participants did not have this option. Other exchanges were also excluded from accessing DFP publishers' inventory in real-time.[81]

5) In the early 2010s, publishers started developing home-grown solutions to allow non-Google exchanges and DSPs to submit real-time bids

115. Around 2014, publishers began to experiment with a new approach to overcome the Waterfall and Google's Dynamic Allocation limitations on real-time bidding from other exchanges and DSPs. An initial home-grown solution allowed non-Google exchanges and DSPs to also submit real-time bids. Publishers began adding a script in the header tag of their web pages, which allowed participating exchanges and DSPs to submit bids for impressions in an auction run on the publisher's webpage.[82] This process, known as Header Bidding, occurred before the impression was sent to the publisher ad server.[83] The publisher ad server would then receive the winning bid from the Header Bidding auction.[84]

116. Header Bidding allowed publishers to circumvent Google's exchange by offering their ad inventory directly to other exchanges and, ultimately, advertisers. Moreover, for the first time, rival exchanges and DSPs had the opportunity to bid on DFP publisher inventory, which was previously only available through AdX.[85] In other words, Header Bidding provided demand sources with a new route to

[81] Google (undated). "Maximizing advertising revenues for online publishers". [White Paper]. https://static.googleusercontent.com/media/www.google.com/en//googleblogs/pdfs/revenue_maximization_090210.pdf ("Dynamic allocation is a unique technology that works by passing to the Ad Exchange the CPM value associated with any non-guaranteed ad that DFP is about to serve."); *See also,* DoubleClick Ad Exchange (undated). "Profiting from Non-Guaranteed Advertising: The Value of Dynamic Allocation & Auction Pricing for Online Publishers" 2010. DoubleClick by Google. p.3. [White Paper]. https://web.archive.org/web/20170830013310/http:/static.googleusercontent.com/media/www.google.com/en/us/adexchange/DC_Ad_Exchange_WP_100713.pdf ("Combined with Dynamic Allocation, DoubleClick Ad Exchange's real-time auction mechanism enables publishers to receive the highest yield across all participating buyers for any given ad impression. An approach employed by some third-party technology providers, by contrast, estimates and computes a priori the expected CPM from a given buyer. These systems use average, historical CPM values to predict the price that a given buyer will pay, then use that predicted value to call the ad network with the highest projected CPM.")

[82] AdExchanger. "The Rise Of 'Header Bidding' And The End Of The Publisher Waterfall" (June 18, 2015). Accessed on April 26, 2024. https://www.adexchanger.com/publishers/the-rise-of-header-bidding-and-the-end-of-the-publisher-waterfall/ ("To enable it, publishers put a piece of code in the header of their pages, allowing demand sources to submit bids before the ad server callout […] That is, a single unified auction where demand sources compete side by side rather than sequentially")

[83] Adpushup. "Header Bidding Explained" (undated). Accessed on May 2, 2024. https://resources.adpushup.com/header-bidding-explained ("Header bidding is an advanced programmatic technique that allows publishers to offer their inventory to multiple SSPs and ad exchanges before requesting ad servers from DoubleClick for Publishers (DFP).")

[84] Sovrn. "Header Bidding Explained: Terms to Know" (September 12, 2016). Accessed on May 2, 2024. https://www.sovrn.com/blog/header-bidding-explained-terms-know/#:~:text=Ad%20server%20%E2%80%93%20The%20winning%20bids%20from%20header,compete%20against%20AdX%20dynamic%20allocation%20at%20that%20time ("Ad server – The winning bids from header bidding auctions are sent along to the publisher's ad server to select the appropriate line item and return the winning creative to the correct zone on the page. For most publishers using DFP, the winning bid must also compete against AdX dynamic allocation at that time.")

[85] Ad Ops Insider. "Header Bidding Explained Step-by-Step" (June 8, 2015). Accessed on May 2, 2024. https://www.adopsinsider.com/header-bidding/header-bidding-step-by-step/ ("tag based integrations create inefficiency because they force an average rate to compete with the impression level bids of AdX (if the publisher is on DFP).")

reach publishers' inventory; this new route was no longer exclusively controlled by the publisher ad server. As an "auction of auctions," Header Bidding was a first-price auction.[86]

117. Header Bidding used wrappers to set parameters for the Header Bidding auction, which allowed publishers to easily add and manage new demand sources without increasing page load times. Wrappers are JavaScript codes, separate from other codes present on a publisher's site, that trigger the bidding process between a publisher and their demand partners once a user visits a webpage. These wrappers enable the auction to take place directly on the publisher's page. For this reason, they are often referred to as client-side wrapper. One of the most popular client-side wrappers is Prebid.js, which has a library of demand sources that publishers can add and remove easily.

118. Client-side wrappers gave publishers visibility into bids but also came with technical limitations. In particular, client-side Header Bidding contributed to latency issues during the initial page load and auction execution. It also required major set-up investments from the publisher. Server-side Header Bidding that moves the auction to a dedicated server evolved as a solution to the latency and investment issues. Instead of residing on the publishers' web pages, the code resides on the server, which executes the entire auction logic remotely and selects a winner. The tradeoff for solving the client-side wrapper issues, however, is that server-side solutions offer less transparency to publishers.

119. The flexibility and features of Header Bidding made it appealing to publishers. It provided them with more transparency and control than the Waterfall process and guaranteed better yield management. Header bidding also allowed advertisers to access previously unavailable inventory by bypassing ad exchanges.[87]

IV. RELEVANT ANTITRUST MARKETS

120. In this section of the report, I identify the markets relevant to my analysis.[88] I start by providing the key economic principles of defining a relevant antitrust market. I then analyze each of the relevant markets. For each market, I consider various factors that assist in defining the markets. I then apply the

[86] Adpushup. "Header Bidding" (undated). Accessed on May 2, 2024. https://www.adpushup.com/header-bidding-guide/#:~:text=Header%20auction%20works%20on%20the%20first-price%20auction%20model%2C,pay%20exactly%20what%20they%20bid%20during%20the%20auction ("Header auction works on the first-price auction model, which means that the highest bidder gets to serve their ad creative, and they pay exactly what they bid during the auction.")

[87] AdExchanger. "The Rise of 'Header Bidding' And The End of the Publisher Waterfall" (June 18, 2015). Accessed on May 2, 2024. https://www.adexchanger.com/publishers/the-rise-of-header-bidding-and-the-end-of-the-publisher-waterfall/ ("Header bidding solves a buyer problem: the need for access to a publisher's best inventory. And it solves a publisher problem: the loss of programmatic revenue because of server setups that reduce competition.")

[88] I use the terms relevant market and antitrust market interchangeably. I may also refer to a market as a shorthand for product market.

hypothetical monopolist test. Next, I define the relevant geographic market for all relevant product markets. I find there are four relevant product markets: (1) the market for publisher ad servers used for open web display advertising inventory, (2) the market for ad exchanges for transacting indirect open web display advertising, (3) the market for ad buying tools for small advertisers for buying open web display advertising space, and the market for ad buying tools for large advertisers for buying open web display advertising space. The relevant geographic market for each is the United States.[89]

A. The purpose and usefulness of market definition

121. The first step in the standard approach to analyzing anticompetitive conduct for the purposes of antitrust analysis is to identify and define the relevant markets for examination. This allows for the identification of the areas to test whether examined conduct gives rise to anticompetitive effects, in the form of higher prices or lower product quality compared to competitive outcomes. Even though such conduct can occur within a broad economic system with many interrelationships, potential first-order effects of the conduct can be identified and understood by identifying the markets where those effects are likely to occur.

122. In this regard, market definition depends on the antitrust context being examined. The markets I analyze are those where (a) the conduct takes place and (b) where the effects of the conduct take place. In each case, it is important to define markets appropriately to first examine the presence of market power (that is, who are the entities, if any, constraining the firm under examination) and second, to examine the extent to which competition in a market may change as a result of the conduct (in this case, by removing constraints from the firm under examination).

123. In what follows, four relevant markets will be identified that are of relevance to the analysis of Google's conduct in this matter. Those four markets are situated in each stage of the "production" chain from advertisers, indicating their demand for advertising opportunities, to publishers selling advertising supply space (i.e., access to consumers), mediated by an ad exchange. In each case, market definition involves identifying relevant consumer classes with regard to their substitute opportunities for advertising along this "production" chain and the alternative possibilities for the use of space offered to advertisers.

B. The economic principles of market definition

124. A market is defined by the set of consumers, products, and suppliers who provide them. Whether a consumer is part of a market depends on whether those consumers purchase the product (or products) of

[89] The United States includes all of the Plaintiff entities.

suppliers in the market. Whether a supplier is part of a market depends on whether it is one of the suppliers that are relatively close substitutes for the product from a consumer perspective. And whether a product is part of the market depends on whether it is a member of the consideration set for consumers in providing the functions or value they are looking to consume.

125. Given this, economists focus on particular dimensions by which to delineate market participation. One is examining a product supplied and whether other products are relatively close substitutes or not—this is the product market dimension. Another is examining where both consumers and suppliers are located with respect to demanding and supplying the product under question—this is the geographic market dimension.

1) The Product Dimension

126. In defining the product markets, I use the approach articulated in the 2010 and 2023 DOJ and FTC Merger Guidelines.[90] Market definition is a tool to delimit a set of products to analyze competitive effects. Next, the Merger Guidelines recommend that markets be defined based on demand-side substitution while market participants are defined based on supply-side substitution.[91] I follow this approach when defining product markets. The Guidelines then note that "within a broad relevant market, however, effective competition often occurs in numerous narrower relevant markets. Market definition ensures that relevant antitrust markets are sufficiently broad, but it does not always lead to a single relevant market."[92] While some of the markets that I define may contain smaller markets, the market

[90] U.S. Department of Justice and the Federal Trade Commission. "Merger Guidelines" Section 4.3 (December 18, 2023). Accessed on June 2, 2024. https://www.justice.gov/d9/2023-12/2023%20Merger%20Guidelines.pdf; *See also,* U.S. Department of Justice and the Federal Trade Commission. "Horizontal Merger Guidelines" Section 4 (August 19, 2010). Accessed on June 2, 2024. https://www.justice.gov/sites/default/files/atr/legacy/2010/08/19/hmg-2010.pdf ("First, market definition helps specify the line of commerce and section of the country in which the competitive concern arises. In any merger enforcement action, the Agencies will normally identify one or more relevant markets in which the merger may substantially lessen competition.")

[91] U.S. Department of Justice and the Federal Trade Commission. "Merger Guidelines" Section 4.3 (December 18, 2023). Accessed on June 2, 2024. https://www.justice.gov/d9/2023-12/2023%20Merger%20Guidelines.pdf. ("A relevant antitrust market is an area of effective competition, comprising both product (or service) and geographic elements. The outer boundaries of a relevant product market are determined by the "reasonable interchangeability of use or the cross-elasticity of demand between the product itself and substitutes for it."); *See also,* U.S. Department of Justice and the Federal Trade Commission. "Merger Guidelines" Section 4.3 (December 18, 2023). Accessed on June 2, 2024. https://www.justice.gov/d9/2023-12/2023%20Merger%20Guidelines.pdf. ("Market definition focuses solely on demand substitution factors, i.e., on customers' ability and willingness to substitute away from one product to another in response to a price increase or a corresponding non-price change such as a reduction in product quality or service.")*; See also,* Shapiro, Carl. "The 2010 Horizontal Merger Guidelines: From Hedgehog to Fox in Forty Years" (September 10, 2010). Available at SSRN: https://ssrn.com/abstract=1675210 or http://dx.doi.org/10.2139/ssrn.1675210

[92] U.S. Department of Justice and the Federal Trade Commission. "Merger Guidelines" Section 4.3 (December 18, 2023). Accessed on June 2, 2024. https://www.justice.gov/d9/2023-12/2023%20Merger%20Guidelines.pdf; *See also,* U.S. Department of Justice and the Federal Trade Commission. "Horizontal Merger Guidelines" Section 4 (August 19, 2010). Accessed on June 2, 2024. https://www.justice.gov/sites/default/files/atr/legacy/2010/08/19/hmg-2010.pdf ("Market shares of different products in narrowly defined markets are more likely to capture the relative competitive significance of these products, and often more accurately reflect competition between close substitutes.")

definition I use serves the purpose of delimiting a set of products in which to analyze the competitive behavior in question. Smaller markets can be appropriate when price discrimination between types of customers is possible.[93] The DOJ and FTC Commentaries to the Horizontal Merger Guidelines ("the Commentaries") further recognize that customer testimony and business documents can be the best source of customer substitution patterns in the event of a price increase.[94] My analysis uses such evidence to define the various relevant markets. Finally, the Commentaries recognize that relevant markets can be defined even when market boundaries are not precise or rigid.[95] While the products within each of the markets I identify compete most intensely with each other, these products may still compete with products outside the relevant market to a small degree.

127. There are two approaches to achieving the goal of defining relevant markets. A relevant market can be identified using evidence of qualitative market characteristics or practical indicia. In the seminal *Brown Shoe* case, the U.S. Supreme Court instructed that practical indicia can be used to define a relevant product market.[96] These indicia include industry or public recognition of the market as a separate economic entity, the product's peculiar characteristics and uses, unique production facilities, distinct customers, distinct prices, sensitivity to price changes, and specialized vendors. They are "evidentiary proxies for direct proof of substitutability" in demand.[97] Economists have also endorsed this standard methodology employed by the Supreme Court. For example, Jonathan Baker, in a 2000 *Antitrust Law Journal* article, explains that Brown Shoe factors are measures of supply and demand that are standard tools used by economists in economic analyses.[98]

---

[93] U.S. Department of Justice and the Federal Trade Commission. "Horizontal Merger Guidelines" Section 4 (August 19, 2010). Accessed on June 2, 2024. https://www.justice.gov/sites/default/files/atr/legacy/2010/08/19/hmg-2010.pdf ("The possibility of price discrimination influences market definition (see Section 4), the measurement of market shares (see Section 5), and the evaluation of competitive effects (see Sections 6 and 7).")

[94] U.S. Department of Justice and the Federal Trade Commission. "Commentary on the Horizontal Merger Guidelines" pg.9 (2006). Accessed on May 8, 2024. https://www.ftc.gov/sites/default/files/attachments/merger-review/commentaryonthehorizontalmergerguidelinesmarch2006.pdf ("Customers typically are the best source, and in some cases they may be the only source, of critical information on the factors that govern their ability and willingness to substitute in the event of a price increase.")

[95] U.S. Department of Justice and the Federal Trade Commission. "Commentary on the Horizontal Merger Guidelines" pg. 15 (2006). Accessed on May 8, 2024. https://www.ftc.gov/sites/default/files/attachments/merger-review/commentaryonthehorizontalmergerguidelinesmarch2006.pdf ("Integrated [a]nalysis [t]akes into [a]ccount that [d]efined [m]arket [b]oundaries [a]re [n]ot [n]ecessarily [p]recise or [r]igid")

[96] Brown Shoe Co., Inc. v. United States, 370 U.S. 294 (1962) (The boundaries of such a submarket may be determined by examining such practical indicia as industry or public recognition of the submarket as a separate economic entity, the product's peculiar characteristics and uses, unique production facilities, distinct customers, distinct prices, sensitivity to price changes, and specialized vendors.")

[97] Opinion for the Court, Rothery Storage & Van Co. v. Atlas Van Lines, Inc., No. 84-5845 (D.C. Cir.), June 3, 1986, 219. *See also*, Epic Games v. Apple Inc., 493 F. Supp. 3d 817 (N.D. Cal. 2020)

[98] Baker, Jonathan B., "Stepping Out in an Old *Brown Shoe*: In Qualified Praise of Submarkets." *Antitrust Law Journal* vol. 68, no. 1. 2000. pgs. 203-218 (For example, "Sensitivity to price changes, for example, could be interpreted as suggesting a method of estimating demand cross- elasticities"); *See also,* U.S. Department of Justice and the Federal Trade

128. The second standard economic method to define relevant product markets is the hypothetical monopolist test (HMT).[99] The test asks whether a hypothetical monopolist over the products in a candidate market would profitably choose a "small but significant and non-transitory increase in price" (SSNIP), resulting in a price above competitive levels or an equivalent reduction in quality below competitive levels. If there is sufficient substitution to cause the price increase to be unprofitable, then the next best substitute product is added to the candidate market, and the test is repeated. The process continues until it would be profitable for the hypothetical monopolist to impose a SSNIP or an equivalent reduction in quality. In this case, the possibility of substitution to alternatives outside the candidate market does not adequately discipline the hypothetical monopolist, and the collection of products is a relevant antitrust market.

129. The HMT must be undertaken carefully where a firm already has monopoly power and prices are elevated above competitive levels.[100] Scholars have long recognized that, in such circumstances, a legitimate antitrust market must be constructed from baseline prices that approximate competitive levels.

130. The HMT contemplates a coordinated increase in price beginning at competitive levels by a group of suppliers in a market. The purpose is to identify whether actions by those consumers bearing the price increase would constrain the incentives of that hypothetical monopolist to increase the price. If it is found that those bearing the price increase would substitute away if faced with a SSNIP, the group of suppliers under consideration may be too restricted to define the market. Alternatively, if it is found that those bearing the price increase would not substitute away if faced with a SSNIP, the group of suppliers under consideration may define the market or the market is defined too broadly, and the HMT can be applied to a smaller set of suppliers acting as a hypothetical monopolist.

131. When there are distinct groups of consumers that may bear all or part of the price increase under the HMT, then a price increase is not possible if *all* of those consumer groups will likely substitute away to alternatives. However, if not all of those consumer groups will likely substitute away to alternatives,

---

Commission. "Merger Guidelines" Section 4.3 (December 18, 2023). Accessed on June 2, 2024. https://www.justice.gov/d9/2023-12/2023%20Merger%20Guidelines.pdf

[99] U.S. Department of Justice and the Federal Trade Commission. "Merger Guidelines" Section 4.3 (December 18, 2023). Accessed on June 2, 2024. https://www.justice.gov/d9/2023-12/2023%20Merger%20Guidelines.pdf. ("The Hypothetical Monopolist Test, […] is a method by which the Agencies often define relevant antitrust markets.")

[100] United States v. E. I. du Pont de Nemours & Co., 351 U.S. 377 (1956); *See also,* U.S. Department of Justice and the Federal Trade Commission. "Merger Guidelines" Section 4.3 (December 18, 2023). Accessed on June 2, 2024. https://www.justice.gov/d9/2023-12/2023%20Merger%20Guidelines.pdf. (For example, "In the entrenchment context, if the inquiry is being conducted after market or monopoly power has already been exercised, using prevailing prices can lead to defining markets too broadly and thus inferring that dominance does not exist when, in fact, it does. The problem with using prevailing prices to define the market when a firm is already dominant is known as the "Cellophane Fallacy"); *See also,* Shapiro, Carl. "The 2010 Horizontal Merger Guidelines: From Hedgehog to Fox in Forty Years" (September 10, 2010). Available at SSRN: https://ssrn.com/abstract=1675210 or http://dx.doi.org/10.2139/ssrn.1675210

the price increase can still be implemented by the hypothetical monopolist with the incidence (or pass-through) being borne by the consumer group without substitutes.

132. What this indicates is that, as a practical matter of implementing the HMT, it is sufficient to find a lack of substitutes for a given product on only one side of the market. ad tech tools facilitate the advertising transaction between publishers and advertisers.[101] As long as *one* side of the market (i.e., the advertiser-side or the publisher-side) has limited substitutes for a given ad tech product, a hypothetical monopolist could profitably impose a SSNIP or an equivalent reduction in quality to that one side.[102]

2) The Geographic Dimension

133. Geographic location is a dimension upon which the degree of substitutability on the demand or supply side might be salient. When there are transportation costs or distinct institutional environments, consumers' supply options may be constrained to suppliers located close to them or within the same jurisdiction, and suppliers' consumer opportunities might be similarly constrained. In this case, a natural boundary for analysis is to confine the analysis of conduct to those taking place in markets defined by a geographical boundary.

134. Geographic markets depend on the limits to which firms can transport products to serve customers or the willingness of customers to travel to alternative suppliers. The same principles used to define product markets apply to defining a geographic market. The practical indicia approach can be used to define geographic markets that correspond to "commercial reality."[103] Under the HMT approach, a geographic market consists of the region in which a hypothetical monopolist could impose a SSNIP that would not be defeated by customers making substitute purchases outside the region.[104]

[101] While not all tools in the ad tech stack *directly* interact with both sides of the market (publishers and advertisers), it is still reasonable to consider ad tech tools as bringing the two sides of the market together (i.e., transacting demand from advertisers and supply from publishers). The products in each of the relevant product markets I define (publisher ad servers, ad exchanges, ad buying tools for large advertisers, and ad buying tools for small advertisers) facilitate transactions between publishers and advertisers.
[102] The effects of an increase in fee can be analyzed in a similar manner that economists study the incidence of a tax increase.
[103] Brown Shoe Co., Inc. v. United States, 370 U.S. 294 (1962) (The boundaries of such a submarket may be determined by examining such practical indicia as industry or public recognition of the submarket as a separate economic entity, the product's peculiar characteristics and uses, unique production facilities, distinct customers, distinct prices, sensitivity to price changes, and specialized vendors.")
[104] U.S. Department of Justice and the Federal Trade Commission. "Merger Guidelines" Section 4.3d (December 18, 2023). Accessed on June 2, 2024. https://www.justice.gov/d9/2023-12/2023%20Merger%20Guidelines.pdf. (For example, "A relevant antitrust market is an area of effective competition, comprising both product (or service) and geographic elements. A market's geography depends on the limits that distance puts on some customers' willingness or ability to substitute to some products, or some suppliers' willingness or ability to serve some customers.")

135. The industry analyzed here will be demonstrated to be online as will each of the markets considered. Therefore, while the hardware involved in supplying products may have a specific geographic location, the providers may be registered as legal entities in specific geographic locations and the consumers may reside or operate in specific geographic locations, for the purpose of evaluating the competitive implications of the conduct examined here, geographic driven constraints will, in general, not be shown to play a decisive role. Thus, the geographic dimension will not be of importance for understanding the nature of competition and the presence of market power in the markets considered even if my focus has been on their operation within a particular political boundary. I, note, however, that the application of remedies or damages should they be imposed, may involve geographic dimensions but that these are separate from the economic analysis I conduct here and serve a distinct evidentiary purpose.

C. There is a relevant antitrust market for publisher ad servers used for the sale of open web display inventory

136. The first relevant market I evaluate and identify in this report is the market for publisher ad servers used for the sale open web display inventory.[105] As evaluated below, excluded from this relevant market are ad servers used for the sale of other types of inventories (e.g., outstream video inventory, Connected TV inventory, and in-app inventory) and other ad tech tools (e.g., in-house tools and mediation tools). These other types of inventories are not substitutes for publishers that sell open web display ad inventories. Publishers primarily use publisher ad servers to transact open web display inventory. As discussed below, my review of documents and other sources in this case supports my opinion that publishers that sell open web display inventory are a distinct customer group.

137. On the other hand, other types of inventories, such as outstream video inventory, Connected TV inventory, and in-app inventory, form a small fraction of the inventories served by publisher ad servers in comparison to open web display inventory. [redacted][106] Publishers that have a large majority of in-app inventory usually use mediation tools, such as Google's AdMob, that are specifically intended for in-app monetization, rather than ad

[105] In later sections of this report, I may use a shorthand version of this. In that case, I mean the market definitions stated here.
[106] [redacted]

servers used for the sale of open web display advertising.[107,108] I discuss this difference in Section IV.C.3.b.

138. Ad servers can be used by publishers to offer display advertising, in-app advertising, and video advertising. It can also be used to facilitate direct deals with advertisers. However, publishers that sell display ad space on the open web must use an ad server. Effective substitution by publishers selling web display inventory would imply switching entirely from the open web to an alternative type of inventory most publishers do not have, such as in-app advertising where another tool, other than an ad server can be used. The substitution away from open web display advertising would have to be complete. This is because if a publisher sells both in-app and open web display, it must still use an ad server. This alone does not mean that a monopolist that owned all publisher ad servers could not exercise market power.

139. Some publishers do own several types of inventories. They perceive these different deal types as complementary sources of monetization, and "fundamentally believe they get maximum yield through a broad mix of deal types."[109] For instance, The Washington Post owns both a website and a mobile app. In this case, a publisher ad server for the sale of open web display advertising is still required.

140. The main Google product in this market is DoubleClick for Publishers or DFP. In 2008, Google acquired DoubleClick and its ad serving tool, DoubleClick for Publishers (DFP).[110] DFP enabled publishers to make real-time decision about what ad to serve, serve ads on their websites, manage their ad inventories, and collect data related to their inventory. Starting in 2016, Google consolidated its ad

[107] Google reflects this segmentation and differentiates between in-app and display for questions of market definition, performance, penetration rate, and product development. *See,* GOOG-NE-03467508 at -511, 514, 516, 535, 543. "Business Forecasting Meeting (Sell-Side)" (June 24, 2019). Internal Google presentation to review past performance, forecast the sell-side business, and develop business strategies; GOOG-NE-03615215 at -217. "Platforms & Media Pricing Review" (May 2015). Internal Google presentation reviewing different ad platforms and their prices; GOOG-NE-03900351 at -357, 360. "Q1 2017 DVAA Metrics Review: Health of the Display & Video Business" (March 22, 2017). Internal Google presentation reviewing display and video business by the DVAA team; Google also notes the difference in market growth. *See,* GOOG-NE-03900351 at -357. "Q1 2017 DVAA Metrics Review: Health of the Display & Video Business" (March 22, 2017). Internal Google presentation reviewing display and video business by the DVAA team. ("Highest growth is coming from Apps, web inventory flattening.")

[108] GOOG-NE-06866438 at -511. "Sell-side All Hands" (February/March 2018). Internal Google PowerPoint on sell-side tools topics (yield maximization, web developers, etc.). (Presentation delineates that the "market segmentation that applies to the vast majority (over 90%) of app developers: publishers who are app-centric or app-only" use AdMob, while publishers who have both app and web inventory use DFP); *See also,* GOOG-NE-07251927 at -995. "Display and Video Strategy Book" (August 2014). Internal Google document about its business, platforms, and strategies. ("Mobile app developers are considered a separate customer segment from (web) content publishers, and AdMob is their monetization platform."); GOOG-NE-04001130 at -131. "What are the guiding principles and approached for our publisher strategy, given the ecosystem change?" (September 10, 2018). Internal Google paper discussing about Google's sell-side business. (Google further makes the distinction between both types of publishers: "App developers using AdMob are mostly pure play with little/no web presence," which sets them apart from open web display publishers.)

[109] GOOG-NE-13244847 at -848. "Re: Update on AdX YM: Client feedback and Latest Progress" (February 2, 2011). Internal email thread between [redacted], [redacted], [redacted] and others.

[110] The Seattle Times. "Google finally acquires DoubleClick" (March 12, 2008). Accessed on April 29, 2024. https://www.seattletimes.com/business/google-finally-acquires-doubleclick/

exchange (AdX) and publisher ad server (DFP) contracts into a single contract (DRX contracts). In 2018, Google officially merged DFP and AdX under the Google Ad Manager umbrella (GAM).[111]

141. Today, other participants in this market are Equativ (offers SmartAd Server), Rubicon (offers Magnite for sellers), AdButler (offers its Display Ad Server solution), and Broadstreet (offers its Broadstreet ad server).[112,113] All these competitors offer open web display ad serving capabilities to publishers. These products are differentiated and have varying arrays of features.

- Google offers open web display ad serving capabilities to publishers. It also enables the transaction of other types of inventories, such as in-stream video, in-app, and Connected TV. Google is closely integrated with its ad exchange.

- Equativ offers open web display ad serving capabilities to publishers. Its ad serving capability is closely integrated with its SSP capability. Equativ also offers the Equativ AdvancedTV platform for publishers to monetize Connected TV inventory.[114]

- Rubicon offers an open web display ad serving capabilities to publishers. It is closely integrated with Rubicon's SSP and also offers capabilities for the monetization of other types of inventories such as video, or Connected TV.[115]

[111] Google Blog. "Introducing Google Ad Manager" (June 17, 2018). Accessed on June 5, 2024. https://blog.google/products/admanager/introducing-google-ad-manager/ ("That's why, for the last three years, we've been doing more to bring DoubleClick Ad Exchange (AdX) and DoubleClick for Publishers (DFP) together into a truly unified platform [...] With these changes, we needed a new name that better reflects how our platform helps you earn more and protects your brand […] As we announced today, that name is Google Ad Manager.")
[112] I discuss entries and exits of competitors in the relevant product market in Section V.
[113] The top 10 alternatives to Google Ad Manager, reviewed by the business software review platform G2, are OpenX, PubMatic, Smart AdServer, Magnite (for sellers), Facebook Audience Network, AdButler, Kevel, ONE by AOL, Unity Ads, and Broadstreet. *See,* G2. "Top 10 Google Ad Manager Alternatives & Competitors" (undated). Accessed on May 2, 2024. https://www.g2.com/products/google-ad-manager/competitors/alternatives. I exclude six of these alternatives: 1) OpenX exited from the ad server market in 2013. *See,* AdExchanger. "OpenX Shuts Down Its OnRamp Ad Server After Big Malware Attack" (February 11, 2013). Accessed on May 2, 2024. https://www.adexchanger.com/online-advertising/openx-shuts-down-its-onramp-ad-server-after-big-malware-attack/; 2) PubMatic is now an SSP, rather than a publisher ad server. *See,* PubMatic. "PubMatic SSP: Maximize Advertising Revenue and Control How Your Audiences are Accessed" (undated). Accessed on May 2, 2024. https://pubmatic.com/products/pubmatic-ssp-for-publishers/; 3) Facebook Audience Network, rebranded to Meta Audience Network, serves in-app ads, rather than online display ads. *See,* Meta. "Monetize your mobile game" (undated). Accessed on May 2, 2024. https://www.facebook.com/audiencenetwork/; 4) Kevel is a self-hosted publisher ad server, or "in-house" tool, that is not a substitute for DFP. *See,* Kevel. "Own your own ad platform" (undated). Accessed on May 2, 2024. https://www.kevel.com/ad-platform; 5) ONE by AOL, which was rebranded to the Oath ad server, shuttered in 2020. *See,* AdExchanger. "Verizon Media Shuts Down Its Ad Server; Legacy Brands Stave Off the DTCs" (March 6, 2019). Accessed on May 2, 2024. https://www.adexchanger.com/ad-exchange-news/wednesday-03062019/#:~:text=Verizon%20Media%20will%20shutter%20the,of%20its%20mobile%20app%20SDK; 6) Unity Ads offers a publisher ad server for in-app ads, rather than display ads, and is thus not a substitute for DFP. *See,* "Grow your mobile app with Unity Ads" (undated). Accessed on May 2, 2024. https://unity.com/products/unity-ads
[114] Equativ. "Industry Expertise + Customized Solutions = Success" (undated). Accessed on May 8, 2024. https://equativ.com/solutions/
[115] Magnite. "Sellers" (undated). Accessed on May 9, 2024. https://www.magnite.com/sellers/.

- AdButler offers open web display ad serving capabilities. It also offers other features, such as targeting options, reporting, and analytics, and enables publishers to serve other inventory types, such as video ads, and mobile ads, across websites, apps, or other digital properties.[116]

- Broadstreet offers small publishers open web display ad serving capabilities. It also enables the serving of other advertising types, such as video.[117]

142. While Google has integrated into all four relevant markets across the ad tech stack relatively few ad server competitors are similarly integrated. For example, Equativ offers ad tech tools to advertisers on the buy side, and an SSP solution.[118] Similarly, Rubicon operates an SSP. AdButler and Broadstreet have not vertically integrated into other parts of the ad tech stack.[119]

143. As described below, producers of publisher ad servers used for the sale of open web display advertising charge publishers a license fee that can vary by the volume of impressions transacted. Different publishers can be charged different amounts.[120] Different types of inventories transacted through third-party publisher ad servers also have distinct pricing formulas. For instance, Google prices display inventory,[121] video inventory,[122] Connected TV inventory,[123] and direct deals[124] differently. For example, Google exempted in-app ads from its Unified Pricing Rules. This is another reason why the relevant market should not include all types of publisher inventory.

---

[116] AdButler. “Take control of your ad sales and earn more” (Undated.) Accessed on June 4, 2024. https://www.adbutler.com/solutions/display-ad-server.html
[117] Broadstreet. “We help small publishers impress, perform, and renew.” (Undated.) Accessed on May 8, 2024. https://broadstreetads.com/
[118] Equativ. “Industry Expertise + Customized Solutions = Success” (undated). Accessed on May 8, 2024. https://equativ.com/solutions/
[119] AdButler. “How AdButler serves ads” (undated). Accessed on May 8, 2024. https://www.adbutler.com/help/article/how-adbutler-serves-ads; *See also,* Broadstreet. “We help small publishers impress, perform, and renew” (undated). Accessed on May 8, 2024. https://broadstreetads.com/
[120] GOOG-AT-MDL-006834890 at -891. “Re: [GPX] Meeting Agenda for January 29, 2018: (1) Pandora Media” (January 29, 2018). Internal email thread between [redacted], [redacted], and others discussing core discounts for Pandora deal with DFP.
[121] GOOG-AT-MDL-013268463. “AdX Rate Card” (April 12, 2023). Internal Google spreadsheet showing Google’s rates card. (The “Standard Rates” tab shows DFP pricing for display and video.)
[122] GOOG-AT-MDL-013268463. “AdX Rate Card” (April 12, 2023). Internal Google spreadsheet showing Google's rates card. (The “Standard Rates” tab shows DFP pricing for display and video.)
[123] GOOG-NE-09180083 at -169. “2019 Video Deep Dive – Sissie/Duk” (September 2019). Internal Google presentation on video inventory. (“Google Ad Manager Advanced TV Solutions (fka DoubleClick for TV) | Linear addressable solution to enable distributors to serve 1:1 ads to households. ~30% margin (~15% for PG) + ~$0.25 CPM DFP fee.”)
[124] GOOG-NE-03467508 at -559. “Business Forecast Meeting (Sell-Side)” (June 24, 2019). Internal Google presentation to review past performance, forecast the sell-side business, and develop business strategies; *See also,* GOOG-DOJ-15375402 at -402. “Re: Pandora DRX Renewal - Finance Questions” (March 15, 2018). Internal email thread between [redacted], [redacted], [redacted], [redacted], and others.

144. Google's and other competitors' products all share the characteristics of publisher ad servers used for the sale of open web display advertising, including real-time decision-making about what ad to serve, ad serving on publishers' websites, targeting capabilities, management of ad inventory, collection of data, and reporting on ad performance, and other services.[125]

145. In this section, I define the relevant market by using both evidence of qualitative market characteristics or practical indicia (Brown Shoe factors) and the hypothetical monopolist test (HMT).[126] I then analyze whether other ad tech tools should be included in the relevant product market and determine that they should not be included. Next, I identify statements from regulatory agencies that corroborate the existence of a separate publisher ad server market.

1) Brown shoe factors indicate a distinct market for publisher ad servers used for the sale of open web display advertising

a) Peculiar characteristics and uses

146. Publisher ad servers have peculiar characteristics that distinguish them from other means by which publishers might offer advertising space to advertisers. Publisher ad servers used for the sale of open web display advertising (1) enable real-time decisions about serving ads on a publisher website or platform; (2) they manage and ultimately sell publishers' ad inventory; (3) they offer targeting capabilities to help publishers identify specific audience segments, and (4) the server software collects data and reports on ad performance.

147. A publisher ad server enables real-time decisions through the following process. When a user visits a website, the publisher ad server receives a request to fill the potential ad slots on the page being displayed to the user. The request contains specific criteria such as the ad's dimensions, the geolocation, and the user device operating system. The publisher ad server then uses its real-time decision-making capabilities to choose a suitable ad based on the information it receives. To do this, the publisher ad server can select an ad that has been transacted directly with advertisers. Separately, it can connect with multiple demand partners, such as ad exchanges and SSPs, by sending an ad request to advertisers to display the ad

[125] Conversation with John Chandler, June 4th, 2024.
[126] U.S. Department of Justice and the Federal Trade Commission. "Merger Guidelines" Section 4.3d (December 18, 2023). Accessed on June 2, 2024. https://www.justice.gov/d9/2023-12/2023%20Merger%20Guidelines.pdf. ("The Hypothetical Monopolist Test, […] is a method by which the Agencies often define relevant antitrust markets.")

to the user.[127] It can also display internal promotions, which are the publisher's own advertising of its services or products (i.e., in-house ads).[128] It, therefore, does more than connect an ad exchange.

148. Publisher ad servers are not just used to facilitate transactions, they also manage and track publisher ad inventory. This includes capabilities for managing and tracking inventory as well as perform inventory forecasting based on campaign and traffic projections.[129] A publisher ad server further has the ability to add websites and ad placements, select precise targeting options for specific audiences or categories of ads, and add rules to prioritize deals.[130]

149. Publisher ad servers help publishers identify specific audience segments based on factors such as location, demographics, device type, interests, and browsing behavior.

150. Finally, a publisher ad server collects and reports data. This includes tracking ad performance metrics such as clicks and conversions and advanced analytics on ad placements and websites. Nitish Korula, Engineering Director at Google, testified that publisher ad servers include these features.[131]

151. As discussed in Section III.D.1, prior to the digital innovations that made publisher ad servers possible, publishers had to fill their inventory via manual processes. This required a salesforce and in-house placement capabilities. The emergence of publisher ad servers obviated the need and, hence, economic viability of these previous arrangements.

b) Industry or public recognition of the market

152. Third parties have indicated that they consider publisher ad servers used for the sale of open web display advertising to be a distinct product or a separate market.[132]

---

[127] ClearCode. "What is an Ad Server and How Does It Work?" (March 14, 2024). Accessed on May 2, 2024. https://clearcode.cc/blog/what -is-an-ad-server/
[128] Kevel. "Why You Should Use an Ad Server for Internal Promotions" (September 24, 2021). Accessed on May 8, 2024. https://www.kevel.com/blog/internal-promotions ("They are also used, however, for optimizing any type of web or app traffic. To promote new paid services, in-house/internal ads, upsells, and so on (which convert users to customers and increase sales), companies are increasingly turning to ad serving tech rather than relying on their CMS.")
[129] ClearCode. "What is an Ad Server and How Does It Work?" (March 14, 2024). Accessed on May 2, 2024. https://clearcode.cc/blog/what -is-an-ad-server/ ("[…] inventory forecasting — i.e. how much inventory and of what type the publisher will have available for sale in the future based on the current campaigns & traffic projections")
[130] "Epom._"Unleash the Full Power of Your Ads with Epom Ad Server" (undated). Accessed on May 8, 2024. https://epom.com/ad-server ("Targeting & Priorities. Deliver your ads to the best audience segments. Use pre-set targeting attributes to narrow the user's range or set up your own targeting based on unique publisher data. Apply 20+ targeting settings right away. Set frequency capping and limits. Re-distribute banner weights for optimal visibility")
[131] Deposition of Nitish Korula (Engineering Director, Google) 36:8 - 36:24, November 3, 2023. ("Q: What makes you think that there's is an incomplete characterization of an ad server? […] A: The reason that I made the point about it not being complete was to clarify that ad servers offer more than ad serving. For example, they may also offer reporting on ads, et cetera […]")
[132] Deposition of [redacted] (Managing Director for Global Publisher Platforms, Google), 90:16-92:2, May 1, 2024 ("Q. And AdX and GAM, those are separate products, correct? […] A. I know them as separate technologies. […] Q. And as we discussed

153. According to Professor John Chandler, an industry expert, participants consider publisher ad servers to be a distinct product and a separate market from an industry perspective. They do not consider publisher ad servers to be an input into a larger product or service.[133]

154. Antitrust regulatory agencies in the United States and around the world have also recognized the existence of a distinct publisher ad server market.[134]

c) A distinct and independent price structure

155. Google's publisher ad server does not charge publishers up to a certain volume of impressions served. Publishers who sell volumes above this floor qualify for Google's ad publisher server's paid tier with the basic cost of a license starting from $1,500 per month. DFP offers several pricing plans to publishers.

156. I have identified five participants in the relevant market. I have pricing information for three of them.[135] Table 1 below summarizes the pricing structure for those three products.

previously, you know them as separate technologies because they serve separate functions, correct? A. In my opinion. Q. And the basis of your opinion is working at Google, correct? A. Working at Google; but most importantly, working in the industry. Q. And what do you mean by you base your opinion in working in the industry? A. The definition of an ad server versus the definition of an ad exchange. I see those as two separate technologies. Q. So just to summarize, in your opinion, AdX and Google Ad Manager are separate technologies based both on your work at Google and also your work outside of Google in the industry, correct? […] A.: Based on the definition of an ad server and the definition of an ad exchange, they serve different functions. […] Q. And that is based on your work at Google and in the broader industry outside of Google, correct? A. That is correct.").

[133] Conversation with John Chandler, June 4th, 2024.

[134] Federal Trade Commission. "Statement of Federal Trade Commission concerning Google/DoubleClick" pg. 6 (December 20, 2007). Accessed on May 9, 2024. https://www.ftc.gov/system/files/documents/public_statements/418081/071220googledc-commstmt.pdf. (In its 2007 statement concerning the acquisition of DoubleClick by Google, the FTC defines publisher ad servers as a relevant product market. It defines ad serving as a market, distinct from exchanges and advertiser ad buying tools.); *See also,* Competition and Markets Authority. "Online platforms and digital advertising: Market study final report" pg. 345 (July 1, 2020). Accessed on May 10, 2024. https://assets.publishing.service.gov.uk/media/5efc57ed3a6f4023d242ed56/Final_report_1_July_2020_.pdf. (The CMA, in its 2020 Online Platforms and Digital Advertising Report, defines a "publisher ad server market."); French Competition Authority. "Decision 21-D-11 of June 07, 2021 regarding practices implemented in the online advertising sector" pg. 74 (July 26, 2021). Accessed on June 4, 2024. https://www.autoritedelaconcurrence.fr/sites/default/files/attachments/2021-07/21-d-11_ven.pdf. (The FCA, in its 2021 decision regarding practices implemented in the online advertising sector, recognizes a "publisher ad server market," distinct from other tools such as advertiser ad buying tools, SSPs, and mediation tools. In its response to the FCA, Google agreed to the definition of a distinct market for publisher ad server.)

[135] Equativ (fka Smart AdServer) and Magnite for sellers (fka Rubicon) provide custom pricing information at sign-up.

Table 1

Pricing for Top Publisher Ad Servers[136]

Publisher Ad Server	Pricing Model
DFP	Small Business and Premium products with CPM volume tiers; Additional fees for add-on services; Higher fees for other types of inventory such as video inventory, Connected TV inventory, and direct deals
AdButler	Free trial period; monthly fee varies based on ad requests and number of advertisers
Broadstreet Ad Server	Monthly fee varies based on add-on features

2) The HMT reveals that publisher ad servers used for the sale of open web display advertising is a relevant product market

157. Based on my application of the HMT or hypothetical monopolist test, a small increase in the price of publisher ad servers above competitive levels would not result in significant substitution by open web display publishers to other products. In response to an increase in price, publishers have two potential options.

158. The first option would be for publishers to stop selling or monetizing their ad inventory on their web properties. This would result in significant losses. For example, a large publisher such as The New York Times has over 9.7 million digital-only subscribers. It attributes 20.8% of revenue to advertising, with 62.9% of that, roughly $318MM, generated through digital advertising in 2023.[137] It is highly unlikely a 5% price increase in the market for publisher ad server used for the sale of open web display advertising would cause the publishing giant to eliminate digital advertising from its content.

[136] The table lists the top publisher ad servers listed by the business software review platform, G2. As mentioned, I exclude six of these alternatives. *See,* G2. "Top 10 Google Ad Manager Alternatives & Competitors" (undated). Accessed on May 2, 2024. https://www.g2.com/products/google-ad-manager/competitors/alternatives.
[137] The New York Times. "2023 Annual Report" (undated). Accessed on May 8, 2024. https://nytco-assets.nytimes.com/2024/03/2023-Annual-Report_WR_-Final.pdf ("Paid digital-only subscribers totaled approximately 9.70 million as of December 31, 2023"; page 80 provides the revenue breakdowns)

159. For publishers who do not have other selling or monetization channels as part of their current businesses, creating those new channels would involve a significant cost. For instance, charging users for content or taking out paid subscriptions would require changing their relationship with those users who are currently used to content that was freely available. Publishers would need to convince their user base to pay for content that was previously free; something users are often reluctant to do. Publishers would risk losing significant revenue generation and a large portion of their user base.

160. A second response to a SSNIP would be to build in-house serving capabilities to replace the publisher ad server. Building and maintaining in-house tools is more costly than a SSNIP. It requires significant financial investments in terms of infrastructure and personnel and are, thus, not a reasonable substitute.

3) In-house tools and mediation tools are not participants in the relevant product market for publisher ad servers used for the sale of open web display advertising

161. As depicted below in Figure 3, some publishers, such as Facebook and Amazon, are Walled Garden Publishers (WGPs). Google explains that unlike open-web display inventory, Walled Garden inventory is not "accessible to everyone."[138] In a WGP, advertisers are matched to one and only one publisher.

[138] GOOG-TEX-01201334 at -362. "Buyside Deep Dive" (March 2018). Internal presentation on buy-side tools.

Figure 3

Google presentation showing the difference between WGP inventory and inventory "everyone has access" to[139]

[redacted]

162. As explained above, publishers can only monetize the inventory on websites and webpages that they own. Publishers cannot substitute to search ads without owning a search engine, social ads without owning a social media platform, or in-stream video ads without owning video content. Thus, an increase in the price of serving display ads would not cause publishers to serve search, social, or in-stream ads.

163. Even if publishers abandon display advertising for other types of advertising, most will not. Moreover, because the publisher ad server is required for serving open web advertising, there is no reason to substitute to other ad tech tools unless open web advertising is abandoned altogether. Most publishers only sell open web display advertising. Publishers that focus on other types of ad inventory usually already use other ad tech tools designed to meet the need of selling other types of advertising. For instance, publishers that have a majority of in-app inventory usually use mediation tools, such as

139 [redacted]. Internal presentation on buy-side tools.

Google's AdMob, that are specifically intended for in-app monetization, rather than publisher ad servers used for the sale of open web display advertising.[140,141]

164. In this section I explain in more detail why in-house tools used by WGPs and mediation tools used for in-app advertising are not a viable alternative for publisher ad servers used for the sale of open web display advertising.

a) In-house tools are not participants in the relevant product market

165. In-house tools are publisher ad servers that publishers build rather than license from a third party. Building an in-house tool is challenging, requiring technological expertise. For most publishers, in-house tools are not an option for managing their ad inventory. In-house tools are usually only accessible to large publishers specialized in social advertising, video advertising, or large retailers.[142]

166. In a survey developed by The Interactive Advertising Bureau, publishers identified technological challenges as one of the main reasons for not developing an in-house tool: "Technology challenges prevail with publishers as more than two-thirds (67%) of those without an in-house strategy, and not considering one, cite both difficulties in understanding the technology requirements and keeping up with changing technology as the key reasons."[143] The Forbes Technology Council describes that the difference in choosing to go with a publisher ad server versus building in-house depends on the publishers' internal

[140] Google reflects this segmentation and differentiates between in-app and display for questions of market definition, performance, penetration rate, and product development. *See,* GOOG-NE-03467508 at -511, 514, 516, 535, 543. "Business Forecasting Meeting (Sell-Side)" (June 24, 2019). Internal Google presentation to review past performance, forecast the sell-side business, and develop business strategies; GOOG-NE-03615215 at -217. "Platforms & Media Pricing Review" (May 2015). Internal Google presentation reviewing different ad platforms and their prices; GOOG-NE-03900351 at -357, 360. "Q1 2017 DVAA Metrics Review: Health of the Display & Video Business" (March 22, 2017). Internal Google presentation reviewing display and video business by the DVAA team; Google also notes the difference in market growth "Highest growth is coming from Apps, web inventory flattening." *See,* GOOG-NE-03900351 at -357. "Q1 2017 DVAA Metrics Review: Health of the Display & Video Business" (March 22, 2017). Internal Google presentation reviewing display and video business by the DVAA team.

[141] GOOG-NE-06866438 at -511. "Sell-side All Hands" (February/March 2018). Internal Google PowerPoint on sell-side tools topics (yield maximization, web developers, etc.). (Presentation delineates that the "market segmentation that applies to the vast majority (over 90%) of app developers: publishers who are app-centric or app-only" use AdMob, while publishers who have both app and web inventory use DFP); *See also,* GOOG-NE-07251927 at -995. "Display and Video Strategy Book" (August 2014). Internal Google document about its business, platforms, and strategies. ("Mobile app developers are considered a separate customer segment from (web) content publishers, and AdMob is their monetization platform."); GOOG-NE-04001130 at -131. "What are the guiding principles and approached for our publisher strategy, given the ecosystem change?" (September 10, 2018). Internal Google paper discussing about Google's sell-side business. (Google further makes the distinction between both types of publishers: "App developers using AdMob are mostly pure play with little/no web presence," which sets them apart from open web display publishers.)

[142] Examples of large publishers specialized in social media advertising include Facebook and Instagram. Examples of large publishers specialized in video advertising include Hulu and Disney. Examples of large shopping retailers monetizing include Amazon and Walmart.

[143] IAB Europe. "Attitudes to Programmatic Advertising" pg. 15 (September 2020). Accessed on May 8, 2024. https://iabeurope.eu/wp-content/uploads/2020/10/IAB-Europe-Attitudes-to-Programmatic-Advertising-Report-2020-1.pdf. (IAB is the Interactive Advertising Bureau, an American organization developing industry standards for the advertising industry and regularly conducting research.)

skills, financial resources, flexibility regarding time to market, and need requirements.[144] Similarly, the French Competition Authority, in its 2021 decision regarding practices implemented in the online advertising sector, explained that publishers developing their own publisher ad server solution is "exceptional" and that "only the largest publishers are currently able to effectively operate a technology solution developed in-house."[145] Even the large publisher Webedia indicated that in-house solutions did not meet its needs.[146]

167. Developing and operating in-house tools is prohibitively costly for all but the very largest providers of advertising space. Maintaining in-house tools requires significant labor and financial investments due to overhead costs. Google states that "in-house mediation pubs are likely to have more technical staff" to perform analysis and experimentations in-house.[147] [redacted][148] [redacted][149] Similarly, [redacted].[150] The price can vary as it includes a platform fee and a fee for each time the publisher calls the API. By contrast, DFP is not only free for small publishers but the cost to serve per impression for larger publishers is also small.

[144] Forbes Technology Council. "When to Build a Tool in-House and When to Use an Outside Vendor." (April 8, 2016). Accessed May 8, 2024. https://www.forbes.com/sites/forbestechcouncil/2016/04/08/when-to-build-a-tool-in-house-and-when-to-use-an-outside-vendor/?sh=4253458ca0db
[145] French Competition Authority. "Decision 21-D-11 of June 07, 2021 regarding practices implemented in the online advertising sector" pg. 16 (July 26, 2021). Accessed on June 4, 2024. https://www.autoritedelaconcurrence.fr/sites/default/files/attachments/2021-07/21-d-11_ven.pdf
[146] French Competition Authority. "Decision 21-D-11 of June 07, 2021 regarding practices implemented in the online advertising sector" pg. 16 (July 26, 2021). Accessed on June 4, 2024. https://www.autoritedelaconcurrence.fr/sites/default/files/attachments/2021-07/21-d-11_ven.pdf
[147] GOOG-TEX-00109745 at -748. "Cracking the In-house Mediation Market" (September 14, 2019). Internal Google strategic document about how to crack the (non-O&O) in-house mediation market.
[148] Deposition of [redacted]; *See also*, Deposition of [redacted]
[149] Deposition of [redacted]
[150] Deposition of [redacted]

168. WGPs (e.g., Facebook, Snapchat, Amazon, etc.) typically built their own in-house tools to sell "directly to the advertisers."[151] These publishers are not only very large but they have a recurring and loyal user base. Most publishers lack both the resources and the unique user base to become a WGP, and therefore, becoming a WGP is not a viable option for most publishers.

169. According to Google: "walled gardens happen when one company captures a very large loyal audience. That gives them access to consumer data and control over ad formats."[152] In that case, in-house tools enable publishers to keep control over who can access their ad formats and data. For example, Facebook is a publisher with an in-house tool. Google summarizes the difference in an internal strategy document: "Facebook is doing this already – they are offering publishers access to FB demographic data if they use Facebook's Liverail exchange, while at the same time, they do not allow our DBM tool to buy Facebook's O&O inventory."[153] O&O inventory is distinct from display advertisements, e.g., Facebook O&O inventory is a social media advertisement.

170. Google acknowledges that Amazon's business model sets it apart from Google's advertising business.[154] Amazon closely links its advertising business to its core sales and so uses its advertising business to fuel its marketplace sales. Amazon's ad buying tool, Amazon Ad Console, developed by Amazon for vendors to purchase content on Amazon properties only, is an example of a large publisher developing an advertiser-facing in-house tool for its specific needs. An internal presentation explains that "While [Amazon would] certainly love to make money on Ad Tech, they can use [Amazon Console] to offer lower prices to consumers – increasing overall sales."[155] [redacted][156] Google also acknowledges this particularity: "One important thing to note

---

[151] Deposition of [redacted] (Director of Strategic Partnerships- Ad Platforms, Google) 125:18-126:23, April 23, 2024. ("Q. Do you have an understanding of what publishers would be included in this "walled gardens" term? […] THE WITNESS: In general, it would be publishers who do not use, you know, any of the, you know, ad tech platform, you know, or make their inventory available. You know, only directly to the advertisers.")
[152] GOOG-TEX-00036284 at -320. "DRX Introduction" (December 2015). Internal Google presentation by DRX PM and eng team.
[153] GOOG-TEX-00036284 at -320. "DRX Introduction" (December 2015). Internal Google presentation by DRX PM and eng team.
[154] GOOG-NE-09710197 at -289. "Competitive Strategy Update DVAA Staff" (July 31, 2018). Internal Google presentation about firm strategy. ("Amazon is a different type of competitor: ads drive retail value")
[155] GOOG-NE-09710197 at -289. "Competitive Strategy Update DVAA Staff" (July 31, 2018). Internal Google presentation about firm strategy.
[156] [redacted]0000046 at -049. [redacted]

that is unique to Amazon, since it sells product: if you run out of stock, the ads stop running, too."[157] This demonstrates that Amazon's main need in selling ads on its platform is to support its core line of business.

171. Header Bidding tools are not tools that can replace a publisher ad server used for the sale of open web display advertising. Header Bidding providers such as Prebid describe Header Bidding as an integration with the publisher ad server rather than a standalone product.[158] Header Bidding retrieves bids and passes information to the publisher ad server, but the publisher ad server still determines the winner of an impression.[159] The publisher ad server remains responsible for ad inventory management and targeting, while a Header Bidding solution provides additional bids for the publisher ad server to select.

172. I conclude that in-house tools are not part of the relevant product market.

b) In-app mediation tools are not participants in the relevant product market

173. As I explained above, the large majority of publishers using publisher ad server used for the sale of open web display advertising are solely monetizing open web display inventory. In contrast, publishers that have a large majority of in-app inventory usually use mediation tools, that are specifically intended for in-app monetization, rather than publisher ad servers used for the sale of open web display advertising.[160]

---

[157] GOOG-NE-09710197 at -211. "Competitive Strategy Update DVAA Staff" (July 31, 2018). Internal Google presentation about firm strategy.

[158] Prebid. "Ad Server Integration" (undated). Accessed on May 9, 2024. https://docs.prebid.org/adops/ad-server-integration.html#:~:text=As%20an%20independent%20header%20bidding,re%20going%20to%20use%20it. ("Before you start your Prebid implementation, you need to have signed on with an ad server. As an independent header bidding solution, Prebid was designed to work with any ad server.")

[159] Prebid. "Why Prebid.js" (undated). Accessed on May 9, 2024. https://prebid.org/product-suite/prebidjs/. ("PreBid Process: "Prebid.js fetches bids - The ad server's tag on page is paused, bound by a timer, while the Prebid.js library fetches bids and creatives from various SSPs & exchanges you want to work with. Prebid.js passes bid information - Prebid.js passes information about those bids (including price) to the ad server's tag on page, which passes it to the ad server as query string parameters. Ad Server targets bid parameters - The ad server has line items targeting those bid parameters. Ad server signals Prebid.js - If the ad server decides Prebid wins, the ad server returns a signal to Prebid.js telling the library to write the winning creative to the page.")

[160] Google reflects this segmentation and differentiates between in-app and display for questions of market definition, performance, penetration rate, and product development. *See,* GOOG-NE-03467508 at -511, 514, 516, 535, 543. "Business Forecasting Meeting (Sell-Side)" (June 24, 2019). Internal Google presentation to review past performance, forecast the sell-side business, and develop business strategies; GOOG-NE-03615215 at -217. "Platforms & Media Pricing Review" (May 2015). Internal Google presentation reviewing different ad platforms and their prices; GOOG-NE-03900351 at -357, 360. "Q1 2017 DVAA Metrics Review: Health of the Display & Video Business" (March 22, 2017). Internal Google presentation reviewing display and video business by the DVAA team; Google also notes the difference in market growth "Highest growth is coming from Apps, web inventory flattening." *See,* GOOG-NE-03900351 at -357. "Q1 2017 DVAA Metrics Review: Health of the Display & Video Business" (March 22, 2017). Internal Google presentation reviewing display and video business by the DVAA team.

174. Mediation tools were created as publisher ad servers that specialized for in-app advertising, and app developers used these tools to manage and sell their in-app ad inventory.[161] Mediation tools only serve publishers that sell in-app inventory.

175. Google owns a mediation tool, AdMob. Google sells AdMob as a separate product (with a different price) to publishers selling in-app inventory.

176. A Google presentation delineates the following "market segmentation that applies to the vast majority (over 90%) of app developers": publishers who are "app-centric or app-only" use AdMob, while publishers who have both app and web inventory use DFP.[162] Another presentation outlines that: "Mobile app developers are considered a separate customer segment from (web) content publishers, and AdMob is their monetization platform."[163] Google further makes the distinction between both types of publishers: "App developers using AdMob are mostly pure play with little/no web presence," which sets them apart from open web display publishers.[164]

177. The Competition and Markets Authority (CMA), the competition authority in the United Kingdom, concluded that the ad tech tools used for open web display advertising are usually different from those used for in-app advertising.[165] This is due to a technical distinction leading mediation tools to evolve to be more like networks than exchanges: "On many mobile apps, user journeys are more structured or linear; as the next advertising opportunity is known beforehand, it is easier for publishers to pre-fetch ads. For example, in an app-based game, the next advertising opportunity may arise when the user completes the 'current level'. By contrast, when users browse a webpage, they may click on any one of a number of links, navigating to many different pages. Ads for all of these cannot be fetched in

[161] Publishers whose ad inventory is available on an application are usually referred to as app developer. Although, the developers can be distinct from the owner of the app, which would then be understood as the publisher.
[162] GOOG-NE-06866438 at -511. "Sell-side All Hands" (February/March 2018). Internal Google PowerPoint on sell-side tools topics (yield maximization, web developers, etc.).
[163] GOOG-NE-07251927 at -995. "Display and Video Strategy Book" (August 2014). Internal Google document about its business, platforms, and strategies.
[164] GOOG-NE-04001130 at -131. "What are the guiding principles and approached for our publisher strategy, given the ecosystem change?" (September 10, 2018). Internal Google paper discussing about Google's sell-side business.
[165] Competition and Markets Authority. "Online platforms and digital advertising: Market study final report - Appendix M: intermediation in open web display advertising" pg. M12, M13 (July 1, 2020). Accessed on May 9, 2024. https://assets.publishing.service.gov.uk/media/5fe495c28fa8f56afaf406d4/Appendix_M_-_intermediation_in_open_display_advertising_WEB.pdf.

advance."[166] The CMA explained that this ability to "pre-fetch" ads may reduce the latency of calling multiple networks sequentially.[167]

D. There is a relevant market for ad exchanges for transacting indirect open web display advertising

178. The second relevant market that I define is the market for ad exchanges for transacting indirect open web display advertising.[168] As evaluated below, excluded from this relevant market are direct transactions and other ad tech tools, such as networks and publisher ad servers.

179. An ad exchange enables the programmatic trading of impressions through auctions, connects sell-side and buy-side tools, collects data, and detects fraud.[169] While an ad exchange can transact several types of inventories, they are primarily used to transact indirect open web display advertising.

180. The main Google product in this ad exchange market is AdX. In 2008, Google acquired DoubleClick and its ad exchange tool, formerly known as DoubleClick Ad Exchange and renamed to AdX. AdX enables publishers and advertisers to sell and buy open web display advertising in a real-time marketplace, where prices are set in a real-time auction.[170] Starting in 2016, Google consolidated its ad exchange (AdX) and ad server (DFP) contracts into a single contract (DRX contracts). In 2018, Google officially merged DFP and AdX under the Google Ad Manager umbrella (GAM).[171]

181. Today, other participants in this market are Xandr, OpenX, Magnite, Index Exchange, and Pubmatic.[172] All these competitors offer features to transact open web display inventory. Google's and

[166] Competition and Markets Authority. "Online platforms and digital advertising: Market study final report - Appendix M: intermediation in open web display advertising" pg. M12 (July 1, 2020). Accessed on May 9, 2024. https://assets.publishing.service.gov.uk/media/5fe495c28fa8f56afaf406d4/Appendix_M_-_intermediation_in_open_display_advertising_WEB.pdf
[167] Competition and Markets Authority. "Online platforms and digital advertising: Market study final report - Appendix M: intermediation in open web display advertising" pg. M13 (July 1, 2020). Accessed on May 9, 2024. https://assets.publishing.service.gov.uk/media/5fe495c28fa8f56afaf406d4/Appendix_M_-_intermediation_in_open_display_advertising_WEB.pdf. ("Moreover, the latency associated with calling multiple networks sequentially may affect users less in mobile app environments, where it is more common to 'pre-fetch' ads.")
[168] I may use a shortened version of this market definition, such as the ad exchange market. If I do so, I mean the market for ad exchanges for transacting indirect open web display advertising.
[169] I distinguish programmatic from unprogrammatic or direct transactions.
[170] Google. "The DoubleClick Ad Exchange" (undated). June 3, 2024. https://static.googleusercontent.com/media/www.google.com/en//adexchange/AdExchangeOverview.pdf
[171] Google. "Introducing Google Ad Manager" (June 27, 2018). Accessed on June 5, 2024. https://blog.google/products/admanager/introducing-google-ad-manager/.
[172] I discuss entries and exits of competitors in the relevant product market in Section V. According to [redacted] *See*, Deposition of [redacted]

other competitors' products all share the characteristics of ad exchanges for transacting indirect open web display advertising, including enabling the programmatic trading of impressions through live auctions, connecting sell-side and buy-side tools, and collecting data. Some players do not limit their offerings to the transaction of open web display advertising and focus more heavily on specific inventory types. For example, Magnite focuses on the transaction of Connected TV inventory and in-stream video inventory.[173] Other differences in offering include integration capabilities. For instance, AdX is closely integrated with other Google products, such as Google Ads.

182. Only a few competitors in the market for ad exchanges also provide buy-side and sell-side tools. The Magnite ad exchange has diversified its offerings, operating a streaming content publisher ad server and data management platform, as well as offering ad tech tools to advertisers on the buy side.[174] Both AppNexus and OpenX attempted to compete in the publisher ad server market but have exited the market to focus solely on programmatic ad serving.[175] Index Exchange and Pubmatic have not vertically integrated into other parts of the ad tech stack.[176]

183. As described below, providers of ad exchanges receive a percentage of publishers' payout ("take-rate" or "revenue share"). Different publishers can be charged different amounts. Different types of inventories transacted through exchanges also have distinct pricing formulas. For instance, Google prices display, video and app inventory differently.[177] Google also prices open auction, programmatic direct, private auctions, and programmatic guaranteed differently.[178]

184. In what follows, I define this relevant market using qualitative market evidence or practical indicia (Brown Shoe factors) and employing a hypothetical monopolist test. I then evaluate whether direct transactions and other ad tech tools should be included in the market for ad exchanges and find they

---

[redacted]

173 Magnite, Inc., "Form 10-K for the Fiscal Year Ended December 31, 2023," 2024. pg. 3. https://investor.magnite.com/static-files/cb759e35-5d3a-4405-b871-3be0d8526e8e. ("key strategic objectives, industry growth rates for ad-supported connected television ("CTV") and the shift in video consumption from linear TV to CTV").

174 Magnite. "Sellers" (undated). Accessed on May 9, 2024. https://www.magnite.com/sellers/; *See also,* Magnite. "Buyers" (undated). Accessed on May 9, 2024. https://www.magnite.com/buyers/

175 Kevel. "OpenX Ad Server Alternatives" (December 19, 2018). Accessed on May 9, 2024. https://www.kevel.com/blog/openx-ad-server-alternatives

176 Index Exchange. "One Exchange. Every Channel." (undated). Accessed on May 9, 2024. https://www.indexexchange.com; *See also,* Pubmatic. "Our Products" (undated). Accessed on May 9, 2024. https://pubmatic.com/products/

177 GOOG-DOJ-AT -01826536 at -537. "Re: [Please read] ISBA/PwC Programmatic Study - Google preparation" (May 5, 2020). Internal email thread between [redacted] and [redacted]. ("We are very transparent on Open Bidding fees. These are set at 95:5 to the publisher for web Display inventory and 90:10 for Video and App inventory.")

178 GOOG-NE-02643927 at -927. "2019 DVA Waffle: Buyside Fee, Rev Share, Net Rev % Media Spend" (October 1, 2019). Internal Google slides on different revenue metric for distinct inventory types. (The slide indicates that in 2019, Google charged [redacted].)

should not be included. Next, I identify statements from regulatory agencies that corroborate the existence of a similar market.

1) Brown shoe factors indicate a distinct market for ad exchanges for transacting indirect open web display advertising space

a) Peculiar characteristics and uses

185. An ad exchange is a software product that has the following distinct features. First, it enables the programmatic trading of impressions through auctions. Second, it connects and gathers data from sell-side and buy-side tools. According to [redacted][179]

186. An ad exchange enables publishers and advertisers to trade impressions, functioning as a type of digital marketplace.[180] Because it allows buyers to compete for ad inventory in auctions.[181] This is enabled through programmatic auctions using RTB. When a user visits a page, new inventory becomes available, and a bidding process is instantly initiated. The ad exchange designates the winner of the auction.

187. An ad exchange connects to sell-side and buy-side tools. On the sell side, the ad exchange connects with publisher ad servers to access ad inventory. On the buy-side, it connects to DSP and networks to access advertisers' demand. The exchange gathers information from both sides, such as the data from the cookies on the visited publisher's page or the maximum cost-per-impression set by the advertiser.

b) Industry or public recognition of the market

188. Third parties have indicated that they consider ad exchanges for transacting open web display advertising to be a distinct product or a separate market.

---

[179] Deposition of [redacted]

[180] GOOG-AT-MDL-001004706 at -708. "Ad Manager Ecosystem 101" (June 2019). Internal presentation introducing the ads ecosystem by gTech. (Presentation characterized Ad Exchange as "an online, auction-driven marketplace where ad impressions are sold and bought in real-time. Publishers can place exchange tags on their websites, which will send ad requests to the exchange with every impression. Bidders can bid for each impression – how much they want to pay and what ad they want to display. Exchange selects the winner and displays the ad.")

[181] Amazon Ads. "What is an ad exchange? Learn how they work" (undated). Accessed on May 9, 2024. https://advertising.amazon.com/library/guides/ad-exchange. ("An ad exchange is technology used in programmatic advertising that facilitates the buying and selling of digital inventory using real-time bidding (RTB).")

189. According to Professor Chandler, an industry expert, industry participants consider ad exchanges as a distinct product and a separate market. They do not consider ad exchanges combined with publisher ad servers or ad buying tools as the relevant product.[182]

190. Regulatory agencies have also recognized the existence of a distinct ad exchange market.[183]

c) A distinct and independent price structure

191. Ad exchanges charge publishers a take-rate that is a percentage taken from the revenue transacted through the exchange. In a 2017 competitive analysis, Google described the pricing structure of rival ad exchanges. In the table below, I summarize the pricing models of the other ad exchanges based on Google's analysis. These models are different than, for example, the pricing of publisher ad servers, as shown above.

Table 2

Pricing models of competing ad exchanges[184]

Ad Exchange	Pricing Model
Google AdX	Revenue Share
AppNexus/Xandr (owned by Microsoft)	Revenue Share
Index Exchange	Revenue Share
Magnite (formerly Rubicon and Teleria)	Revenue Share

[182] Conversation with John Chandler, June 4th, 2024.
[183] Competition and Markets Authority. "Online platforms and digital advertising: Market study final report" pg. 283 (July 1, 2020). Accessed on June 4, 2024. https://assets.publishing.service.gov.uk/media/5efc57ed3a6f4023d242ed56/Final_report_1_July_2020_.pdf. (The CMA defines the "SSPs market" (i.e., the exchange market) as a relevant product market.); *See also,* French Competition Authority. "Decision 21-D-11 of June 07, 2021 regarding practices implemented in the online advertising sector" pg. 58 (July 26, 2021). Accessed on June 4, 2024. https://www.autoritedelaconcurrence.fr/sites/default/files/attachments/2021-07/21-d-11_ven.pdf. (Similarly, the FCA defines a "market for non-search supply-side platforms" (i.e. exchange market) as a separate market.)
[184] GOOG-TEX-00971726 at -753. "Header Bidding Observatory #2" (May 2017). Internal Google presentation detailing Header Bidding adoption.

Ad Exchange	Pricing Model
OpenX	Revenue Share
Pubmatic	Single agency-controlled fee model for all media buys transacted on the PubMatic platform[185]

2) The HMT demonstrates that ad exchanges for transacting indirect open web display advertising is a relevant product market

192. Applying the HMT requires asking whether a SSNIP (in this case, a take-rate increase above competitive levels) would result in either a sufficient number of publishers or advertisers switching to products outside the proposed relevant market to render the SSNIP unprofitable. A relevant market for the transaction of indirect open web display advertising exists if *either* publishers or advertisers lack sufficient substitutes because under either circumstance, such that a monopolist that owns all the ad exchanges could profitably raise prices by a SSNIP.

193. Moreover, the customer group with the least substitution options will pay the majority of the take rate, because they are less elastic to prices.[186] The economics of tax incidence governs what portions of the take-rate are, economically, paid by publishers as opposed to advertisers.[187]

194. Publishers directly pay a take-rate for the ad exchange service. If the take-rate were to increase by a SSNIP, publishers would likely not switch to other methods of selling their ad inventory. The alternatives facing publishers are not close substitutes to service ad exchanges offer publishers offering to place open web display ads.

195. In response to an increase in take-rate, publishers would have two potential options. The first potential option would be for publishers to stop monetizing their ad inventory on their web properties. As I explained in Section IV.C.2, this would result in significant losses for publishers and is not a reasonable substitute. Publishers would also not be able to switch to other monetization models, such as subscription-based models.

[185] PubMatic. "PubMatic and Goodway Group Introduce First Fully Transparent, Agency-Controlled SSP Fee Model" (February 7, 2019). Accessed June 5, 2024. https://pubmatic.com/news/goodway-group-ssp-fee-model/
[186] Mankiw, N. Gregory. *Principles of Microeconomics*. 10th ed., Cengage Learning, Inc., 2023, p. 88.
[187] Nicholson, W. *Microeconomic Theory: Basic Principles and Extensions*. 9th ed., Thomson/South-Western, 2005, p. 322. ("$\frac{e_s}{e_s - e_D}$").

196. The second potential option would be for publishers to deal directly with advertisers as they once did during the early-Internet era. As I describe in detail next, direct transactions are not a close substitute for most publishers, and so would not reasonably be included in the relevant market as they require a completely different set of arrangements.[188]

197. Ad networks, in-app networks, and publisher ad servers offer distinct characteristics, uses, and customers and operate differently than open web display ad exchanges. Thus, these products are not reasonable substitutes for open web display ad exchanges.

198. In sum, publishers do not have reasonable substitutes for ad exchanges. This means that even if advertisers were perfectly elastic (i.e., had perfect substitutes for ad exchanges), a hypothetical monopolist would still be able to profitably increase the exchange take-rate.

3) Direct transactions are not in the relevant product market for indirect open web display advertising ad exchange

199. Traditional direct deals are ad campaigns in which advertisers negotiate directly with publishers. Traditional direct deals were inefficient because negotiations were time-consuming, sometimes stretching over weeks before both publishers and advertisers could achieve an agreement.[189] For direct deals, publishers needed to predict how much inventory would be available for a given period of time and struggled to accurately forecast how many users would visit their website, sometimes leaving them with surplus inventory. Historically, indirect deals stemmed from publishers' need to sell this surplus inventory. In his deposition, [redacted].[190,191]

[188] In an online advertising report, the FCA distinguishes between direct and indirect deals. It states that direct deals are not a substitute for other deal types due to the large investments they require. *See,* French Competition Authority. "Opinion no. 18-A-03 of 6 March 2018 on data processing in the online advertising sector" pg. 90 (October 7, 2019). Accessed on June 5, 2024. https://www.autoritedelaconcurrence.fr/sites/default/files/integral_texts/2019-10/avis18a03_en_.pdf. (For example, direct deals "require[s] reaching a certain audience level to attract advertisers. Furthermore, the direct sale of ad spaces [...] requires significant financial investment and human resources.")

[189] Headerbidding.co. "Insertion Order (IO) – Everything You Need to Know" (December 21, 2023). Accessed on May 9, 2024. https://headerbidding.co/insertion-order/; *See also,* Boston Consulting Group. "A Guaranteed Opportunity in Programmatic Advertising" (February 7, 2018). Accessed on May 2, 2024. https://www.bcg.com/publications/2018/guaranteed-opportunity-programmatic-advertising

[190] Deposition of [redacted]

[191] *See also* Deposition of [redacted]

200. As I explained in the industry description, programmatic direct deals enable publishers and advertisers to transact through an automated media buying process. Both programmatic direct and indirect deals are transacted through ad exchanges. However, in direct deals, publishers can solicit bids from a limited and pre-selected set of buyers.[192] Thus, programmatic direct transactions are not a reasonable substitute for indirect, open web transactions because they do not allow publishers prefer to solicit bids from hundreds of buyers at the same time for much of their inventory.

201. A Google document summarizes the differences between the different types of advertising.

Figure 4

Google presentation showing the differences between programmatic indirect deals (open auction) and programmatic direct deals (private auctions, preferred deals, and guaranteed deals)[193]

	Open Auction	Private Auctions	Preferred Deals	Guaranteed Deals
Definition	Your ad inventory is available to all participating programmatic advertisers in a real-time bidding (RTB) online auction where the highest bidder wins the impressions. Publishers can set a minimum CPM or "floor" price for their inventory.	You invite an exclusive group of advertisers to bid on your inventory first through a RTB auction. Usually gamers a higher price than open auctions but may not "fill" or sell 100% of your inventory.	You negotiate a fixed CPM price with select advertiser(s) for specific audiences but impressions are not guaranteed. A buyer gets a "first look" at your inventory and can then decide to buy it or not.	You and a buyer negotiate a fixed CPM price for a guaranteed number of impressions.
Publisher Fit	Small/Medium	Large	Large	Large
Buyers	Hundreds of buyers	Invitation only; auction for selected buyers	One buyer	One buyer
Price	Based on bidding	Negotiated minimum CPM	Negotiated fixed price	Negotiated fixed price
Impressions	Non-guaranteed	Non-guaranteed	Non-guaranteed	Guaranteed

[redacted]

[192] Moreover, publishers still need ad servers to deliver programmatic direct impressions.
[193] GOOG-AT-MDL-004591613 at -626. "Advertising Revenue Playbook" (May 2021). External Google presentation on inventory monetization for publishers.

202. Google's media spend transacted through programmatic indirect (open auction represented [redacted] media spend) in 2019 was [redacted] as media spend transacted through programmatic direct (preferred deals represented [redacted] media spend; private auctions [redacted] and guaranteed deals [redacted]).[194]

203. Google charges lower exchange fees for direct deals compared to indirect deals ([redacted]). A 2019 Google document shows that AdX charged a [redacted] revenue share for open auctions, [redacted] for programmatic direct, [redacted] for private auctions, and [redacted] for programmatic guaranteed.[195]

204. According to Google, direct sales enable publishers to achieve three main goals: to capture more revenue, diversify their ad revenue, and ensure their brand safety. A 2019 presentation explains the specific need served for publishers through direct sales: "Pubs are interested in reaching out to advertisers for more rev (building custom inventory packages) and for brand safety. Pubs want to use advertiser data to strengthen relationships with advertisers for direct deals."[196] Another Google presentation concerning DFP fees on Google-monetized impression from 2012 highlights that publishers consider their directly sold ad inventory as distinct and potentially higher revenue generating: "[Publishers] consider reserve pricing from the perspective of ensuring that they are not cannibalizing demand for their directly sold inventory."[197] Google also notes that publishers consider direct deals for revenue diversification, implying that direct deals are not direct substitutes to other types of ads. A presentation mentions: "Publishers goal is to capture spend across all transaction types in order to diversify their ad revenue and increase overall yield."[198] Google explains how publishers understand inventory allocation for direct deals: "An internal presentation from 2016 states "direct ad sales = highest CPMs, guaranteed. Typical pubs only able to direct sell a portion (typically 30-50%) of their total inventory pool. Rely on non-guaranteed indirect sales to monetize the remainder. They use an SSP to manage real-time buying across huge pools of buyers."[199]

205. Direct deals also enable publishers to extract greater value from their inventory. Because advertisers perceive direct deals to be more valuable, CPMs tend to be higher. In a sales document, Google instructs publishers that direct deals are higher demand products. It gives the example of a publisher that was able to leverage this higher demand offering: "[redacted]

---

[194] GOOG-NE-02643927 at -927. "2019 DVA Waffle: Buyside Fee, Rev Share, Net Rev % Media Spend" (October 1, 2019). Internal Google slides on different revenue metric for distinct inventory types.
[195] GOOG-NE-02643927 at -927. "2019 DVA Waffle: Buyside Fee, Rev Share, Net Rev % Media Spend" (October 1, 2019). Internal Google slides on different revenue metric for distinct inventory types.
[196] GOOG-NE-12106704 at -740. "AdMob +Ad Manager UX greyzone" (October 2019). Internal Google presentation showing qualitative and quantitative research on app publishers' behavior.
[197] GOOG-NE-06732710 at -715. "DFP Fees on Google-monetized impressions" (July 9, 2012). Internal Google presentation.
[198] GOOG-NE-03688816 at -820. "YouTube Player for Publisher Monetization Overview" (June 2018). Internal Google presentation by Youtube/Video Global Solutions.
[199] GOOG-NE-03688816 at -819. "YouTube Player for Publisher Monetization Overview" (June 2018). Internal Google presentation by Youtube/Video Global Solutions.

[redacted]."200 Data produced by Google shows that, in 2021, the CPM, or price paid for programmatic guaranteed AdX impressions, is more than [redacted] than the CPM for impressions transacted through open auction (Figure 5).

Figure 5

CPM of impressions in Open Auction vs Programmatic Guaranteed Transactions in 2021[201]

[redacted]

206. In another document, Google explains that to implement direct deals, publishers "manage the entire end-to-end digital campaign sales and fulfillment process, working directly with advertisers," and it lists the advantages of direct sales as being "direct control of the ads displayed on your site, closer relationship with advertisers, higher prices you can charge for you ad inventory."[202]

---

[200] GOOG-AT-MDL-004591613 at -645. "Advertising Revenue Playbook" (May 2021). Playbook to support small and mid-sized news organizations in their efforts to successfully monetize web content and grow their digital advertising revenue.

[201] [redacted] data is used for this analysis. The following filters are applied to the dataset before computing the CPM: [redacted] I have checked the results for years before 2021 and the results remain similar.

[202] GOOG-AT-MDL-004591613 at -620. "Advertising Revenue Playbook" (May 2021). Playbook to support small and mid-sized news organizations in their efforts to successfully monetize web content and grow their digital advertising revenue; *See also,* GOOG-AT-MDL-001004706 at -719, -754. "Ad Manager Ecosystem 101" (June 2019). Internal presentation introducing the ads ecosystem by gTech. (Google training presentation explains the distinction between programmatic direct deals – particularly

207. Public documents I have reviewed also show that programmatic direct deals are only an option for certain publishers based on inventory availability, technical expertise, and pricing strategy.[203] Programmatic direct sales are only available to certain publishers due to the complexity of contract negotiation, which means publishers must have the expertise to determine pricing, inventory availability, and other terms of the agreement. These reasons also include the difficulty of estimating inventory capacity and the risk of publishers being left with unsold ad space, leading to a loss in revenue. Publishers also need technical expertise to set up and manage. For these reasons, programmatic direct deals are "limited to big players" and "unsuitable for all publishers as it requires huge traffic to enter such deals." This source further explains that programmatic direct deals are for "publisher with highly engaged audiences and a large volume of ad impressions", enabling them to "command premium prices" and have "greater control over your advertising campaigns."[204]

208. Direct deals require large financial and human investments. In a sales presentation, Google alerts publishers that "direct sold requires dedicated internal staffing to manage the entire process, including sales."[205] This means that only specific publishers can engage in them. A Google document highlights the difference between publishers doing direct sales and those that aren't: "Some smaller app publishers are not doing [direct sales] right now due to bandwidth."[206] Google, in its sales material, advises publishers to only consider private auctions, preferred deals, and guaranteed deals if they are large publishers. On the other hand, it recommends open auctions to small and medium publishers.[207]

---

guaranteed deals – and indirect deals by highlighting the distinct campaign goals for which publishers might engage with one or the other: "There are 3 main Line Item types in AdManager with subtypes that differ by campaign goal: 1) guaranteed: campaigns that the publisher guarantees will be delivered; 2) non-guaranteed (remnant): campaigns with best-effort delivery or competing on prices; 3) exchange: dynamically call Ad Exchange or AdSense to get the ad from the buyer; 4) Yield Groups: not a Line Item per say, but a way to traffic Ad Exchange and other SSPs.")

[203] Headerbidding.co. "Programmatic Direct – Everything You Need to Know" (March 27, 2024). Accessed on May 9, 2024. https://headerbidding.co/programmatic-direct/ ("Publishers must determine the pricing, inventory availability, and other terms of the agreement, which can be challenging if they don't have experience in the field [...] if the advertiser cannot fill the entire inventory, the publisher has no other sources to fall back on. This leads to revenue loss [....] only advertisers with big marketing budgets can afford the premium prices of direct deals [...] Technical expertise: Programmatic direct requires certain technical expertise to set up and manage.")

[204] Headerbidding.co. "Programmatic Direct – Everything You Need to Know" (March 27, 2024). Accessed on May 9, 2024. https://headerbidding.co/programmatic-direct/

[205] GOOG-AT-MDL-004591613 at -624. "Advertising Revenue Playbook" (May 2021). Playbook to support small and mid-sized news organizations in their efforts to successfully monetize web content and grow their digital advertising revenue; *See also* GOOG-AT-MDL-001392040 at -094. "Business Forecast Meeting (Sell-Side)" (June 24, 2019). Internal Google presentation to review past performance, forecast the sell-side business, and develop business strategies. (Google states the "efforts required to make and maintain direct connections" as being "deals sourcing: PG requires a salesforce" and "deals management: need to set up an order for each PG vs one time set up for OA.").

[206] GOOG-NE-12106704 at -740. "AdMob +Ad Manager UX greyzone" (October 2019). Internal Google presentation showing qualitative and quantitative research on app publishers' behavior.

[207] GOOG-AT-MDL-004591613 at -626. "Advertising Revenue Playbook" "(May 2021). Playbook to support small and mid-sized news organizations in their efforts to successfully monetize web content and grow their digital advertising revenue.

209. Google refers to smaller publishers as "tail and torso"[208] publishers who "don't need direct deals or any 3P demand."[209] Conversely, Google refers to large publishers as "head" or "premium" and highlights that these publishers need distinct ad management platforms for their "significant direct sales."[210] Google explains that direct deals are "ideal state for buyers [as it enables] decisioning on every impression" and they enable "buyer/sell freedom." This, however, comes at the expense of a "safety feature only available on OA."[211]

210. Direct deals generally have minimum spend requirements that are out of reach for many small publishers. A 2019 Business Forecast Meeting presentation highlights that "PG CPMs [are] higher than for [open auction] and hence [are] targeting different advertiser budgets."[212]

211. Programmatic direct deals are not strong substitutes for programmatic indirect deals despite both transaction types being enabled through exchanges.[213] Google recognizes that programmatic direct sales

[208] GOOG-AT-MDL-008885721 at -749. "2022 AViD Sellside Plan" (2022). Internal Google document on Google's vision for its sell-side tools.
[209] GOOG-NE-12087073 at -073. "Terminology" (undated). Internal Google document about describing platforms and how to answer open segmentation questions. ("AdSense: web-only pubs or pubs who don't need direct deals or any 3p demand.").
[210] GOOG-AT-MDL-006178701 at -748. "DVAA Overview for Ads Staff" (November 27, 2018). Internal Google presentation DVAA and its operating areas.
[211] GOOG-AT-MDL-001392040 at -094. "Business Forecast Meeting (Sell-Side)" (June 24, 2019). Internal Google presentation to review past performance, forecast the sell-side business, and develop business strategies; *See also,* Taboola Blog. "Guaranteed, PMP and Direct: Types of Programmatic Advertising Deals Explained" (undated). Accessed on May 9, 2024. https://blog.taboola.com/types-of-programmatic-advertising-deals/. (A blog explaining the different types of programmatic advertising deals explains the difference between programmatic direct and real-time-bidding: "The upside is that programmatic direct comes with more transparency and brand safety, since advertisers can vet each publishing partner and ad deal individually."); ClearCode. "Understanding RTB, Programmatic Direct and Private Marketplace" (January 31, 2024). Accessed on May 9, 2024. https://clearcode.cc/blog/rtb-programmatic-direct-pmp/#:~:text=In%2520programmatic%2520direct%252C%2520the%2520media-buying%2520process%2520looks%2520like,except%2520for%2520an%2520audit%2520which%2520they%2520carry%2520out. (This increased control is due to "deeper insights into the audiences" in programmatic direct deals.); ClearCode. "Understanding RTB, Programmatic Direct and Private Marketplace" (January 31, 2024). Accessed on May 9, 2024. https://clearcode.cc/blog/rtb-programmatic-direct-pmp/#:~:text=In%2520programmatic%2520direct%252C%2520the%2520media-buying%2520process%2520looks%2520like,except%2520for%2520an%2520audit%2520which%2520they%2520carry%2520out. (Programmatic direct sales are usually more expensive than indirect sales. An article explains: "Because advertisers don't have to wait for campaign data to be routed back through a variety of tools, there is greater, more immediate transparency about impressions served and the audiences that viewed them, which makes advertisers happier and therefore more likely to pay a premium price for direct deals.")
[212] GOOG-AT-MDL-001392040 at -094. "Business Forecast Meeting (Sell-Side)" (June 24, 2019). Internal Google presentation to review past performance, forecast the sell-side business, and develop business strategies. *See also,* Taboola Blog. "Guaranteed, PMP and Direct: Types of Programmatic Advertising Deals Explained" (undated). Accessed on May 9, 2024. https://blog.taboola.com/types-of-programmatic-advertising-deals/. (Explaining the different types of programmatic advertising deals, summarizes: "So, which is better: RTB programmatic vs. direct programmatic? That depends on your goals and budget. Programmatic direct can be pricier and less scalable than RTB because deals are made on a one-to-one basis."); Headerbidding.co. "Programmatic Direct – Everything You Need to Know" (March 27, 2024). Accessed on May 9, 2024. https://headerbidding.co/programmatic-direct/. (Another source highlights that "only advertisers with big marketing budgets can afford the premium prices of direct deals.")
[213] Programmatic advertising stands for the automation of the bidding and transacting of online ads. *See,* GOOG-AT-MDL-001392040 at -094. "Business Forecast Meeting (Sell-Side)" (June 24, 2019). Internal Google presentation to review past performance, forecast the sell-side business, and develop business strategies. (Google states that "cannibalization would be highly

and programmatic indirect sales are distinct. A 2020 presentation titled "Display Business Overview" refers separately to direct sales channels ("Reservations"), and exchanges ("RTB"): "[d]isplay is not a monolithic business: within it, there are three paths for transactions, each with distinct characteristics. Reservation: Direct transactions between advertisers and publishers. […] RTB: Auction connecting advertisers and publishers (primarily large, sophisticated ones), and giving them significant controls. Demand and supply are disaggregated."[214] It also it distinguishes between indirect deals and a specific type of programmatic direct deals, Private Auctions. It states: "Open Auction: everyone can bid on an impression, highest bidder wins in an auction, subject to buyer-specific floors or blocks. Private Auction: publishers can invite selected buyers into private auctions with PA-specific floor. When any bids for PAs come, there is a private auction held before open auction. If it selects a winner, open auction bids are not checked even if they would be higher."[215]

4) Other ad tech tools such as networks and publisher ad servers are not participants in the relevant product market for indirect open web display advertising ad exchange

212. The relevant market for ad exchanges for transacting indirect open web display advertising does not include other products that do not provide an exchange's functionalities, such as ad networks, publisher ad servers, ad buying tools for small advertisers, and ad buying tools for large advertisers. These tools are complementary to ad exchanges and do not enable the programmatic trading in real-time of impressions through auctions.

a) Ad networks are not participants in the relevant product market

213. Networks are intermediaries between small publishers and advertisers. Since ad exchanges for transacting indirect open web display advertising require publishers to meet monthly minimum impressions requirements, networks enable smaller publishers to sell their impressions even when inventory is small. Networks also bid on exchanges on behalf of advertisers. Networks engage in arbitrage and receive a margin. In other words, ad exchanges_for transacting indirect open web display advertising enable RTB callouts while in contract networks respond to the RTB callouts. Thus, networks

---

unlikely" between the direct deals and indirect open web sales. It lists the following reasons: "efforts required to make and maintain direct connections" include deals sourcing requiring a salesforce and deals management requiring a recurrent set up as opposed to a one time set up, "supply and demand dynamics: PG CPMs higher than OA and hence targeting different advertiser budgets," "ideal state for buyers is decisioning on every impression," and "safety feature only available on OA (as PG allows buyer/sell freedom)")

[214] GOOG-TEX-00438280 at -295. "Display Business Overview" (November 2020). Internal Google presentation summarizing Google's business in display ads.

[215] GOOG-AT-MDL-001004706 at -753. "Ad Manager Ecosystem 101" (June 2019). Internal presentation introducing the ads ecosystem by gTech.

represent a distinct sales path and are not included in the market for ad exchanges for transacting indirect open web display advertising.[216]

214. Google recognizes that ad exchanges for transacting indirect open web display advertising and networks are two distinct products in the ecosystem. A 2020 presentation titled "Display Business Overview" refers separately to exchanges ("RTB") and networks: "[d]isplay is not a monolithic business: within it, there are three paths for transactions, each with distinct characteristics. RTB: Auction connecting advertisers and publishers (primarily large, sophisticated ones), and giving them significant controls. Demand and supply are disaggregated […] Network: Closed demand-supply loop, primarily between smaller advertisers and publishers; high degree of automation."[217]

215. The CPMs of ad networks are different from those of ad exchanges for transacting indirect open web display advertising. Due to the nature of the ad network business, where the ad network first buys the advertisement inventory from the publisher and then sells this inventory to the advertisers, ad network CPMs are mostly predetermined or determined through the Header Bidding auction process, whereas ad exchanges' CPMs depends on the bids received during the auction.

216. Networks have greater inventory risk and engage in arbitrage, purchasing on a cost-per-impression basis and reselling on a different basis, such as cost-per-click or cost-per-action. Networks also sometimes purchase or sell blocks of impressions rather than individual impressions.

217. Ad networks usually take 30-40% of the revenue derived by the network, whereas the take rates for ad exchanges for transacting indirect open web display advertising are usually within 10-20%.[218] On average, ad networks have higher take rates than ad exchanges, and their pricing is less transparent.

218. Similarly, there is limited substitution between in-app networks and ad exchanges for transacting indirect open web display advertising. In-app impressions are usually traded through in-app networks rather than ad exchanges. Advertisers use in-app networks to transact with developers. In-app networks are intermediaries that buy ad inventory from developers and resell it to advertisers. This is distinct from ad exchanges for transacting indirect open web display advertising that connect developers and

[216] I understand that Professor Chandler recognizes that ad networks are a distinct from ad exchanges.
[217] GOOG-TEX-00438280 at -295. "Display Business Overview" (November 2020). Internal Google presentation summarizing Google's business in display ads.
[218] Headerbidding.co. "Ad Networks Vs Ad Exchanges – What You Should Know" (February 29, 2024). Accessed on May 9, 2024. https://headerbidding.co/ad-networks-vs-ad-exchanges/ ("Ad Networks don't require any sort of middlemen to monetize. It takes almost 40 percent of whatever you've earned through the platform. For instance, Google AdSense, the world's largest ad network, takes 32% of your revenue for the service provided […] Ad Exchanges require a middleman (SSP) to connect. However, SSPs usually charge anywhere between 10% to 20% in most cases.")

advertisers in real time. In-app networks interact directly with mediation tools both on the publisher's and on the advertiser's side. This requires in-app networks to provide technical support to ensure this interoperability.

b) Publisher ad servers are not participants in the relevant market

219. As described in Section IV.C.1.a, publisher ad servers enable publishers to keep track and sell their ad inventory, with the goal of maximizing advertising revenue, whereas ad exchanges for transacting indirect open web display advertising are real-time auction marketplaces that enable ad buyers and sellers to match on a per-impression basis. Publisher ad servers and ad exchanges have distinct characteristics, use, and customers and are not substitutes for each other.

220. Google differentiates between publisher ad servers and exchanges. Between 2008 and 2018, Google marketed its publisher ad server and exchange as two separate and distinct products. Google also distinguished between its "ad serving software" and its exchange in its 10K SEC filing from 2008 to 2014. Only later did Google reclassify its ad-serving software revenues and blur the distinction between its publisher ad server and exchange in its shareholder reports under the GAM umbrella.[219] As I will show later in this report, Google has bundled its server and its exchange.

c) Ad tech that is part of WGP are not participants in the relevant product market

221. A limited number of publishers have the ability to build in-house ad servers rather than license a third-party ad server. In-house tools come with many challenges, such as technological challenges (i.e., mastering the technological expertise required to develop ad servers internally), and financial challenges (i.e., costs of building, maintaining, and training the workforce to use in-house ad servers). Only the very largest WGPs, such as Amazon and Facebook, are able to establish in-house ad servers.

222. These WGPs often internally determine what advertiser will permitted able to advertise on their properties. This is distinct from the functionality and task performed by an ad exchange for transacting indirect open web display advertising. While an ad exchange matches one of many advertisers to one of many publishers, WGPs select an advertiser. They don't play the role of an intermediary between different players on the sell- and buy-side but rather only match different advertisers to the WGP.

[219] Google Blog. "Introducing Google Ad Manager" (June 17, 2018). Accessed on June 5, 2024. https://blog.google/products/admanager/introducing-google-ad-manager/ ("[…] we broke away from the traditional constraints of "ad servers" and "SSPs" to build new programmatic solutions directly into the product we now call Ad Manager […] Ultimately, with Ad Manager, you get a complete ad platform that helps you earn more and grow revenue, no matter how you sell.")

223. Hence, Amazon, Meta, and other WGPs only select advertisers for the purpose of advertising on their Walled Garden properties (i.e., facebook.com etc.). They do not perform the key functionality of an ad exchange for transacting indirect open web display advertising (the matching of buy- and sell-side) and are thus not to be included in the market for ad exchanges for transacting indirect open web display advertising.

E. There is a relevant product market for ad-buying tools for small advertisers for buying open web display advertising space ("ad buying tools for small advertisers")

224. The third relevant market that I define for the purposes of analyzing Google's conduct is the market for ad-buying tools for small advertisers for buying open web display advertising.[220]

225. The characteristics of ad buying tools for small advertisers for buying open web display advertising include connecting with exchanges and sellers of ad inventory, optimizing demographic and cross device targeting, managing advertising campaigns and remarketing campaigns, collecting data on campaigns' performance, etc.

226. Ad buying tools for small advertisers can serve several types of inventories, such as display inventory, video inventory, in-app inventory, Connected TV inventory, search inventory. However, small advertisers that want to purchase open web display advertising must use an ad buying tool.

227. Most small advertisers want to purchase open web display inventory. As I explained earlier in the report, advertisers of open web display advertising are businesses or individuals who seek to promote their products, services, or their brand, and they use display advertising to reach their target audience and elicit certain actions, such as visiting their website or making a purchase. Many advertisers use open web display advertising in complementarity to other types of advertising.

228. The primary Google product in this market is Google Ads. In 2000, Google launched AdWords to monetize its search engine by enabling advertisers to push their ads higher up on the search engine results page.[221] In 2003, AdWords expanded to display advertising, enabling advertisers to buy display

[220] I use Google's characterization of small advertisers, as I describe in this section.
[221] Google. "Google Launched Self-Service Advertising Program" (October 23, 2000). Accessed on April 29, 2024. https://googlepress.blogspot.com/2000/10/google-launches-self-service.html ("Google Inc., developer of the award-winning Google search engine, today announced the immediate availability of AdWords(TM), a new program that enables any advertiser to purchase individualized and affordable keyword advertising that appears instantly on the google.com search results page [...] CPMs from $15 or 1.5 cents an impression, $12 or 1.2 cents an impression, and $10 or 1 cent an impression, for the top, middle, and bottom ad unit positions, respectively.").

advertising across the open web, beyond Google's search engine. In 2018, AdWords was renamed Google Ads.[222]

229. Today, other participants include Taboola, Criteo,[223] Yahoo, and Microsoft.[224,225] These market participants provide software that allows advertisers to purchase advertising space on open web publisher sites. These competitors offer open web display buying capabilities to small advertisers. Many do not limit their offering to the buying of open web display advertising.

230. As described below, producers of ad buying tools for small advertisers charge advertisers a fee based on media spend. Different small advertisers can be charged different amounts and costs can vary based on add-ons, specific campaigns characteristics, and advertising type.

231. In this section, I continue to define the relevant market by using both evidence of qualitative market characteristics or practical indicia (Brown Shoe factors) and the hypothetical monopolist test. I then clarify why other advertising channels and other ad tech tools are not included in the market for ad buying tools for small advertisers. I also explain why ad buying tools for large advertisers are distinct from ad buying tools for small advertisers.

1) Brown shoe factors indicate a distinct market for ad buying tools for small advertisers for buying open web display advertising

a) Peculiar characteristics and uses

232. An ad-buying tool for small advertisers is a software product that connects to ad exchanges and publisher ad servers, enables the purchasing of ad inventory and makes this process relatively easy to use and manage for advertisers. Advertisers use these ad tech tools to purchase ads to fulfil their campaign

---

[222] Google Ads Help. "Google AdWords is now Google Ads" (July 24, 2018). Accessed on June 4, 2024. https://support.google.com/google-ads/answer/9028765?hl=en ("On July 24th, 2018, Google AdWords became Google Ads.").

[223] [redacted]. In a Deposition, [redacted]

[224] Yahoo and Microsoft have been mostly focused on other types of advertising such as video advertising. *See* Yahoo! Advertising. (undated). Accessed on May 9, 2024. https://www.advertising.yahooinc.com; Microsoft Advertising. (November 16, 2021). Accessed on June 4, 2024. https://about.ads.microsoft.com/en/blog/post/november-2021/reach-new-audiences-with-the-microsoft-audience-network

[225] Until 2020, Meta offered "Facebook Audience Network" (FAN), an ad tech tool that facilitated the purchase of open web display advertising. Today, Meta offers Meta Audience Network, a tool that focuses on the purchase of advertising on Meta own and operated properties and third-party mobile apps. *See* AdExchanger. "Facebook is Killing Off Its Web Supply In Audience Network – And Don't Be Surprised If It All Shuts Down" (February 5, 2020). Accessed on June 4, 2024. https://www.adexchanger.com/platforms/facebook-is-killing-off-its-web-supply-in-audience-network-and-dont-be-surprised-if-it-all-shuts-down/

goals (i.e., optimizing their targeting and impact within their campaign budget). They also use ad-buying tools for small advertisers for buying open web display advertising to track metrics around campaign performance.

b) Industry or public recognition of the market

233. Third parties have indicated that they consider ad buying tools for small advertisers for buying open web display advertising to be a distinct product or a separate market.

234. According to Professor John Chandler, an industry expert, industry participants consider ad buying tools for small advertisers to be a distinct product and a separate market from an industry perspective.[226]

c) A distinct and independent price structure

235. Ad-buying tools for small advertisers for buying open web display advertising are not transparent about their fees. They often charge advertisers based on the "media cost" of the inventory purchased, which can be charged in different ways, such as cost-per-click (CPC), cost-per-thousand impressions (CPM), cost-per-view (CPV), cost-per-action (CPA), or on a pay-per-sales model (CPS). [227]

236. I summarize the pricing models of the other ad-buying tools for small advertisers for buying open web display advertising below.

Table 3

Pricing models of display ad campaigns in competing ad buying tools for small advertisers

Ad Buying Tool	Media Cost Model
Google Ads	CPC model[228]

[226] Conversation with Prof. John Chandler, June 4th, 2024.
[227] Note that CPC is often associated to the pay-per-click (PPC) metric. Both are considered to be part of the same pricing model. CPC is the paid advertising method and PPC is the financial metric to measure the cost of one click. *See* G2. "PPC vs CPC – What's the Difference" (March 26, 2019). Accessed on April 12, 2024. https://learn.g2.com/ppc-vs-cpc
[228] Google Ads. "Power your business by taking control of your budget" (undated). Accessed on June 5, 2024. https://ads.google.com/intl/en_us/home/cost-tool/ ("CPC bidding means you pay for each click on your ads. In CPC campaigns, you set a maximum cost -per-click bid (or "max. CPC") unless you make large adjustments or use Enhanced CPC.").

Ad Buying Tool	Media Cost Model
Yahoo! Advertising	CPM or CPC model
Taboola	CPM or CPC model[229]
Microsoft Advertising	CPC, CPM, or CPV model[230]
Criteo	CPC model[231]

2) The HMT reveals that ad-buying tools for small advertising for buying open web display advertising via open auction is a relevant product market

237. A small increase in the price of ad-buying tools for small advertisers for buying open web display advertising above competitive levels would not result in significant substitution by small advertisers for other products.[232] In response to an increase in price, small advertisers would have four options. The first option would be to stop display advertising campaigns and switch over to other types of advertising, such as search, social, in-app, or in-stream video advertising. This is not a feasible option. Smaller advertisers especially rely on display advertising to reach a large but targeted audience at an affordable cost. In Section IV.E.3.a, I explain why other types of advertising are not reasonable substitutes to display advertising. Other types of advertising have higher media costs than display advertising. The loss from taking this option would likely be much higher than the small increase in price.

238. The second option is for advertisers to transact directly with publishers. A third approach is to build in-house buying tools. However, these two options are investment-intensive, and are out of reach for most smaller advertisers.

[229] Taboola. "Pricing Model and Billing Basics" (undated). Accessed on June 4, 2024. https://help.taboola.com/hc/en-us/articles/115007069287-Pricing-Model-and-Billing-Basics ("With Taboola, you will pay for your campaigns on a CPC (Cost per Click) basis or CPM (Cost per mill) basis.")
[230] Microsoft Advertising. "Let Microsoft Advertising manage your bids with bid strategies" (undated). Accessed on June 4, 2024. https://help.ads.microsoft.com/apex/index/3/en/56786 ("Bid strategy Enhanced CPC Manual CPM Manual CPV…" Microsoft has many other bidding models for different types of ads as well as bidding models in which advertisers are not in control of their bids.
[231] Criteo. "What's the Difference Between CPC and CPM?" (April 12, 2017). Accessed June 6, 2024. https://www.criteo.com/blog/whats-difference-cpc-cpm/
[232] Deposition of [redacted]

239. A fourth option for advertisers involves switching to ad buying tools used by for large advertisers. Ad buying tools for large advertisers often have minimum spend requirements that smaller advertisers are unable to meet and require large human investments in training specialized in-house teams.

3) Ad tech tools for non-display advertising are not participants in the relevant product market for ad-buying tools for buying open web display advertising

240. In this section, I explain why ad tech tools for non-display advertising are not reasonable substitutes for display ad buying tools, and why ad buying tools for large advertisers, and WGPs' ad buying tools are not part of the relevant product market for ad buying tools for small advertisers for buying open web display advertising.

a) Ad tech tools for non-display advertising are not participants in the relevant product market

241. Ad tech tools for buying non-display advertising, like social media, search advertising, in-stream video advertising, and in-app advertising are not reasonable substitutes for ad-buying tools for advertisers for buying open web display advertising because the ad formats perform different roles for advertisers and enable advertisers to gather distinct user information.

242. None of these types of advertising, i.e., search, social media, in-stream and in-app ads, are reasonable substitutes for display advertising.[233] Regulatory agencies around the world have recognized display advertising as distinct from other types of advertising.[234] Several deponents in this case also confirmed the distinction between these channels.[235]

---

[233] Deposition of [redacted] Conversation with John Chandler, June 4th, 2024.

[234] The FTC, the CMA, and the FCA define display advertising as a standalone market. During the investigation of Google's acquisition of DoubleClick, the FTC highlighted that advertising space sold by search engines was not a substitute for space sold by publishers. The FTC also noted that search and display were priced independently. Commissioner Pamela Jones Harbour even explained that "the majority characterizes search and display advertising as complements rather than substitutes." *See* Federal Trade Commission. "Statement of Federal Trade Commission concerning Google/DoubleClick" pg. 6 (December 20, 2007). https://www.ftc.gov/system/files/documents/public_statements/418081/071220googledc-commstmt.pdf; The CMA, in its 2020 digital advertising report, explains that there is little substitutability between search ads and display ads, "mainly because they perform different roles within the customer purchase journey." *See* Competition and Markets Authority. "Online platforms and digital advertising: Market study final report" para. 5.370 (July 1, 2020). https://assets.publishing.service.gov.uk/media/5efc57ed3a6f4023d242ed56/Final_report_1_July_2020_.pdf; The FCA also explains that search and display ads show little signs of substitutability. The FCA uses an HMT to show that most advertisers would not be likely to switch from one type to the other in the event of a 5-10% price increase. *See* French Competition Authority. "Decision 21-D-11 of June 07, 2021 regarding practices implemented in the online advertising sector" pg. 16 (July 26, 2021). https://www.autoritedelaconcurrence.fr/sites/default/files/attachments/2021-07/21-d-11_ven.pdf

[235] Deposition of [redacted]

Social media advertising

243. The Facebook Boycott in mid-2020 is a natural experiment that demonstrates the lack of switching between social advertising and display advertising. Facebook faced a backlash for hosting "damaging and divisive content."[236] Participating advertisers limited or stopped their spending on Facebook advertising during July 2020; however, most subsequently increased their spend on other social media outlets, such as Snapchat and Pinterest, or did not reallocate their Facebook spend.[237, 238] Further, some advertisers did not join the boycott because of the lack of alternatives to Facebook.

244. Snapchat benefited substantively from the Facebook Boycott with an increased share of paid social spend, up from 8% to 17% in Q3 of 2020 compared with the second quarter for Merkle advertisers.[239] Some advertisers also diverted spending to Twitter[240] during the boycott, while others extended the boycott to Twitter due to criticism similar to Facebook.[241] Moreover, Snapchat is not a large

[redacted] eposition of [redacted] See also Deposition of [redacted] *See also* Deposition of [redacted]

[236] The New York Times. "CVS, Dunkin', Lego: The Brands Pulling Ads From Facebook Over Hate Speech" (June 26, 2020). Accessed on May 9, 2024. https://www.nytimes.com/2020/06/26/business/media/Facebook-advertising-boycott.html

[237] AdExchanger. "Snapchat And Pinterest Benefited from The Facebook Boycott – But Can They Keep It Going?" (February 9, 2021). Accessed on May 9, 2024. https://www.adexchanger.com/social-media/snapchat -and-pinterest-benefited-from-the-facebook-boycott-but-can-they-keep-it-going/; *See also,* Tinuiti. "Facebook Ads Benchmark Report Q2 2020" pg. 5 (July 2020). https://tinuiti.com/research-insights/research/facebook-ads-benchmark-report-q2-2020/; *See also* The Wall Street Journal. "Where Advertisers Boycotting Facebook Are Spending Their Money Instead" (June 29, 2020). Accessed on May 9, 2024. https://www.wsj.com/articles/where-advertisers-boycotting-facebook-are-spending-their-money-instead-11593467895

[238] For a list of official participants, *see* Stop Hate For Profit. "Thank You to All of the Businesses that Hit Pause on Hate" (undated). Accessed on May 9, 2024. https://web.archive.org/web/20200930054652/https:/www.stophateforprofit.org/participating-businesses. Other sources also indicate that many advertisers who did not officially announce their participation in the campaign either cut or reduced spending on Facebook ads. *See* The New York Times. "More Than 1,000 Companies Boycotted Facebook. Did It Work?" (August 1, 2020). Accessed on May 10, 2024. https://www.nytimes.com/2020/08/01/business/media/facebook-boycott.html

[239] AdExchanger. "Snapchat And Pinterest Benefited from The Facebook Boycott – But Can They Keep It Going?" (February 9, 2021). Accessed on May 9, 2024. https://www.adexchanger.com/social-media/snapchat -and-pinterest-benefited-from-the-facebook-boycott-but-can-they-keep-it-going/ ("Clients of Dentsu-owned Merkle, for example, allocated a larger share of their paid social spend to Pinterest (up from 7% to 17%) and Snapchat (up from 8% to 17%) in Q3 of last year compared with the second quarter.")

[240] The New York Times. "More Than 1,000 Companies Boycotted Facebook. Did It Work?" (August 1, 2020). Accessed on May 10, 2024. https://www.nytimes.com/2020/08/01/business/media/facebook-boycott.html ("Other [advertisers], like Hershey and Hulu, beefed up their spending on alternate platforms like Twitter and YouTube.")

[241] Newsweek. "Facebook Boycott Is Now Hurting Twitter as Companies Pause Paid Advertising" (June 9, 2020). Accessed on June 5, 2024. https://www.newsweek.com/twitter-facebook-advertising-boycott-spreads-stop-hate-profit-campaign-social-media-

player in digital advertising. According to eMarketer, Snapchat controls only 0.6% of the US digital ad market. The advertising intelligence agency notes that many advertisers are concerned about the small size of the platform's audience and claim that targeting quality still lags behind Facebook's.[242] Separately, many advertisers claim Twitter's reach is not large enough, with only 22% of US users being on the platform, for it to be a competitive option, and in recent times, user growth has been slowing.[243]

245. Further, the Facebook Boycott did not lead to an increase in spend on open web display advertisements via ad buying tools for advertisers.

246. Even following the extreme event of temporary discontinuation of Facebook ads, most advertisers did not perceive open web display advertising as an attractive alternative to Facebook advertising. This indicates limited substitutability for advertisers between social advertising and open web display advertising.

1514130 ("An advertising boycott of social media giant Facebook is spreading, and rival platform Twitter has found itself caught in the crossfire.")

[242] eMarketer. "eMarketer Lowers Snap Ad Forecast" (September 25, 2018). Accessed on June 5, 2024. https://www.emarketer.com/content/emarketer-lowers-snap-ad-forecast ("They are concerned about the size of Snapchat's audience and feel that measurement and targeting still lag behind Facebook.")

[243] The Wall Street Journal. "Twitter Advertisers Say Service Needs More Users" (October 5, 2013). Accessed on January 19, 2024. https://www.wsj.com/articles/SB10001424052702303492504579115753167390832

Figure 6

[redacted]

247. Advertisers consider social and display advertising as complements and often use both advertising channels to promote the same products. [redacted]"[245] [redacted].[246]

248. Google believes social media ads are meaningfully different from display ads in important ways. A Google presentation first defines both display and social media ads: "Display is defined as interactions with a medium of 'display' or 'CPM', or ad distribution network set to 'content'. Social – Traffic from

---

[244] [redacted]

[245] GOOG-DOJ-AT -00330626 at -666. "Google Display Advertisers 101" (February 2021). Google presentation on display advertisers' profiles, goals, and use of Google Ads.

[246] GOOG-DOJ-AT -00330626 at -666. "Google Display Advertisers 101" (February 2021). Google presentation on display advertisers' profiles, goals, and use of Google Ads.

any of approx 400 social networks."[247] It then highlights the distinct characteristics of social ads and their added value: "Social appears to be more effective than display at assisting purchases."[248] It further states that the "social marketing channel drives higher profitability of a purchase, compared to display", and "Social channel is more effective than display in assisting TR [transactional rate] across all marketing channels."[249] Some deponents in this case confirmed the lack of substitution between display advertising and social media advertising.[250]

249. Moreover, ad tech tools for purchasing social media advertising only enable advertisers to purchase display ads on social media platforms' properties and not on other websites. For instance, advertisers cannot use Facebook Ads to purchase inventory on other websites.

Search advertising

250. Google documents distinguishes between search and display ads in online advertising.[251]

251. Advertisers use both search and display for different purposes. According to a 2021 Google presentation, advertisers use display for "remarketing", "flash campaigns, "feeding the lower funnel", and

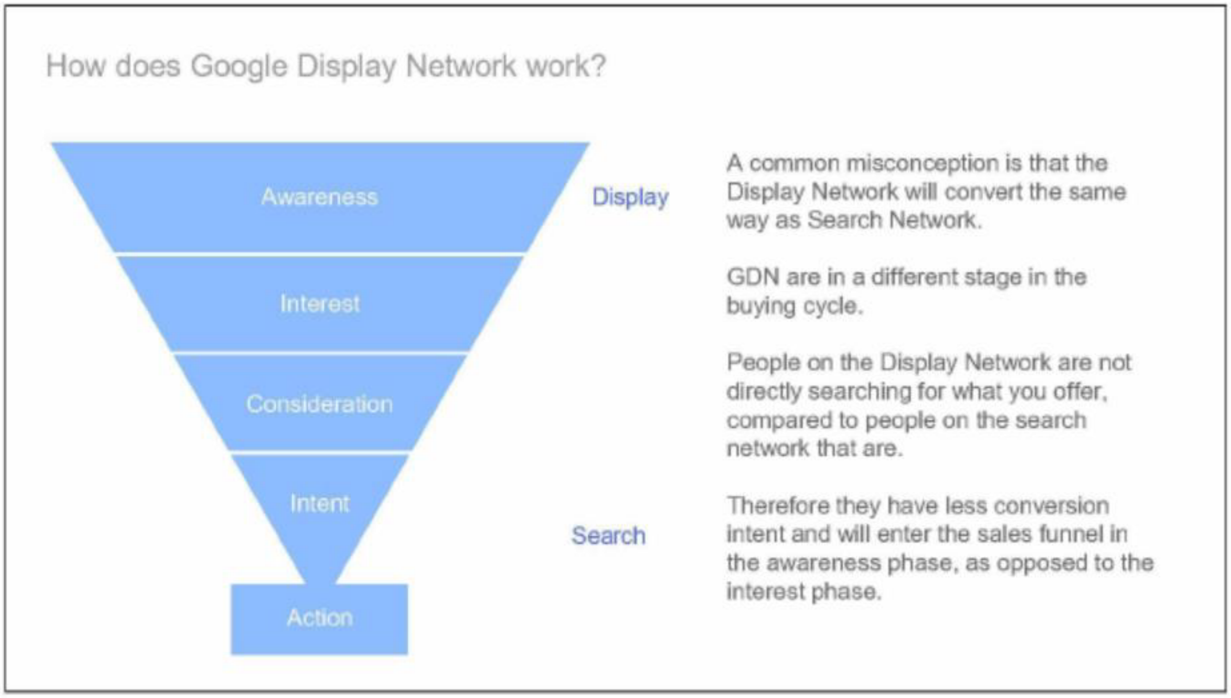
---

[247] GOOG-NE-03900351 at -374. "Q1 2017 DVAA Metrics Review: Health of the Display & Video Business" (March 22, 2017). Internal Google presentation reviewing display and video business by the DVAA team.
[248] GOOG-NE-03900351 at -353. "Q1 2017 DVAA Metrics Review: Health of the Display & Video Business" (March 22, 2017). Internal Google presentation reviewing display and video business by the DVAA team.
[249] GOOG-NE-03900351 at -374. "Q1 2017 DVAA Metrics Review: Health of the Display & Video Business" (March 22, 2017). Internal Google presentation reviewing display and video business by the DVAA team.
TR stands for transactional rate and is defined as the number of transactions divided by the number of online visits.
[250] *See* Deposition of [redacted] and 152:21-24 [redacted]; *See also* Deposition of [redacted]
[251] GOOG-DOJ-17360264 at -265, -266. "adspro" (November 26, 2010). Internal Google email newsletter from [redacted]. ("Although SEM [Search Engine Marketing] refers to placing ads just on search engines, online advertising as a whole is much broader. The possibilities of online advertising include placing ads on nearly any type of website or page a user might browse, such as news, blogs, reviews, entertainment, online magazines, and marketplaces. In AdWords, these other sites make up the Google Display Network."; "Online advertising offers so many options that it's useful to define your advertising goals before beginning. This can help you determine where to place ads (search engines, Display Network pages, or both"; "Ads on the Google Display Network can be in a number of formats, such as basic text ads, graphical image ads in a variety of sizes, audio streams, or interactive and video ads"; "Online advertising offers so many options that it's useful to define your advertising goals before beginning. This can help you determine where to place ads (search engines, Display Network pages, or both) and what format of ads to place, and also help guide your budgeting decisions.")

perceive search as "answer[ing] demand whereas Display generated demand."[252] Advertisers thus these use channels in complementary ways.

Figure 7

Google presentation showing search and display advertising as playing distinct roles in advertising[253]



252. Search and display advertising are priced differently. The average CPC for search advertising in Google Ads is [redacted] versus for display is [redacted].

253. According to [redacted],[254] [redacted]

- [redacted]

[252] GOOG-DOJ-AT -00330626 at -663. "Google Display Advertisers 101" (February 2021). Google presentation on display advertisers' profiles, goals, and use of Google Ads. ("Search answers demand whereas Display generated demand.").
[253] GOOG-DOJ-AT -00221276 at -282. "Google Display Network (GDN)" (2018). Google presentation on buy-side ad tech tools and types of advertising.
[254] [redacted]

[redacted]

- [redacted].[255]

254. Several deponents in this case also confirmed the distinction between display advertising and search advertising.[256]

In-stream video advertising

255. In-stream video ads are distinct from open web display ads in format and end user perception. By combining movement and sound, video increase user's attention and lead to better engagement. In-stream video ads are easier for customers to recall than static images or text. [257]

256. The two forms of ads also have other distinct features. For instance, in-stream video can be skipped as opposed to display ads and advertisers are therefore willing to pay more for non-skippable in-stream video ads as shown in multiple internal documents. [258]

257. Google documents state that "users are much less tolerant of low-quality ads on video because the ads experience tends to be interruptive. Over the years, experiments have shown that low quality ads, placed at the wrong times tend to lead to increased abandonment of user sessions (reducing watch time on YT [YouTube]) or in the case of non-skippable ads increased adblock install rates."[259] This is not a concern with display ads.

---

[255] Similarly, in his deposition, [redacted] *See* Deposition of [redacted]

[256] [redacted]

[257] Adobe Experience Cloud Blog. "Video Advertising" (March 26, 2021). Accessed on May 10, 2024. https://business.adobe.com/blog/basics/video-advertising ("Video advertisements are one of the most effective forms of advertisements, as moving images are easier for customers to recall than static images or text.").

[258] GOOG-NE-04606109 at -113. "Health of the Display & YouTube Businesses (Metrics Review)" (September 2014). Internal Google presentation reviewing the sellside and buyside business. ("[redacted]"); *See also* GOOG-NE-07251927 at -959. "Display & Video Strategy Book" (August 2014). Internal Google document analyzing performance advertising, video ads, and mobile and local ads. ("we could, and have in the past, charge more for non-skippable. The challenge historically has been trying to find a price that wouldn't price us out of the market but would actually incent a shift. According to a recent analysis by the pricing team and feedback from sales, [redacted] discount does not drive adoption of skippable.").

[259] GOOG-NE-07251927 at -949. "Display & Video Strategy Book" (August 2014). Internal Google document analyzing performance advertising, video ads, and mobile and local ads.

258. Google distinguishes between in-stream video and display ads when assembling metrics such as revenue, market penetration rate, product roadmaps.[260] In a strategy deck, Google explains that there are four main inventory types: display content, video content, in-app, search. It opposes "in-stream – for example YouTube pre-roll ads" to "regular ad banners you see on web pages." [261] Google acknowledges the peculiar characteristics of video inventory. It outlines that "video inventory is scarce" and that "there is a growing pool of *unsold* video inventory."[262]

259. Video advertising is more expensive than display advertising. In a deposition, [redacted][263]

260. My analysis of Google data shows that in-stream video ads have very different price structure from open web display ads. For example, in 2022, in-stream video ads have much higher CPM than display ads: [redacted] vs [redacted] in Google Ads and [redacted] vs [redacted] in DV360.[264]

In-app advertising

261. Advertisers consider in-app advertising a distinct type of ad inventory. As Google phrases it, in-app ads "help you service your audience outside the living room."[265] This is especially true since in-app user demographics are different from web display user demographics; industry observers mention that "Gen Zers account for almost 40% of mobile users."[266]

---

[260] Several Google documents differentiate between in-stream video and display ads. *See* GOOG-NE-03467508 at -511. "Business Forecasting Meeting: Sell-Side" (June 24, 2019). Internal Google presentation to review past performance, forecast the sell-side business, and develop business strategies; *See also* GOOG-NE-03615215 at -217. "Platforms & Media Pricing Review" (May 2015). Internal Google presentation reviewing different ad platforms and their prices.
[261] GOOG-AT-MDL-001004706 at -713. "Ad Manager Ecosystem 101" (June 2019). Internal Google presentation introducing the ads ecosystem by gTech.
[262] GOOG-NE-05243813 at -869. "Display Strategy Working Document" (August 2012). Internal Google document.
[263] Deposition of [redacted]
[264] [redacted]
[265] GOOG-NE-02327284 at -362. "Partnering for the Digital Future of Television" (September 17, 2016). Internal Google presentation discussing TV ads.
[266] Forbes. "Understanding The Differences In Mobile App Use Across Generations" (January 12, 2022). Accessed on May 10, 2024. https://www.forbes.com/sites/forbestechcouncil/2022/01/12/understanding-the-differences-in-mobile-app-use-across-generations/?sh=3f4abcd01d18

262. Google also believes that in-app is comprised of fewer use cases for the nature of content and user interaction. A Google document states: "The mobile application market and developer audience is comprised mainly of game, entertainment, education, lifestyle and utility applications. The nature of content and user interaction don't easily adjust to existing AdSense targeting and ad relevancy signals. For instance, contextual targeting produces such oddities as pet psychiatry ads while playing Angry Birds."[267]

263. Advertisers adapt their ads to the context of how customers are using an app (e.g. utility vs engaged game experience vs content browsing) or use granular GPS data to do more geo-targeting. [268] Indeed, unlike display ads, in-app ad formats are highly integrated into the user experience, as opposed to simple banners for example,[269] and Google also defines in-app ad inventory separately as "ads delivered to mobile applications (many formats including banners and video) as opposed to "regular ad banners you see on web pages". [270]

264. The usage characteristics mentioned above result in distinct conversion rates. A Google document states that "[redacted] of users' time is spent in-app vs mobile web, but [redacted] of transactions happen on mobile web. Amazon drives more transaction on mobile web than in their app despite having more installs than the next ten retail apps together."[271] Another internal document outlines that "conversion rates and ROI" differ significantly between app and web ads.[272]

---

[267] GOOG-NE-00112599 at -626. "Mobile Display Ads: Strategy and Planning" (May 2011). Internal Google document on Google's mobile strategy.

[268] GOOG-NE-02634939 at -950. "Brands now have more moments throughout the day to connect with consumers than ever before …" (July 18, 2017). Internal Google presentation. ("Advertisers once thought of apps as a simple reach extension to campaigns and simply repurposed their web banners here. They increasingly understand that apps aren't just like the Web and instead offer a unique opportunity to engage their customers. They are starting to advertise and embrace formats that make better use of context of how customers are using an app (e.g., utility vs engaged game experience vs content browsing) - advertising in Native ads and app video formats, such as Native or Rewarded. […] Many traditional Brand advertisers have been advertising on the Web for 10-15 years! With apps, they're still ramping up. As they advertise more in-app, they're moving beyond simple app Placement targeting to buying and measuring Apps inventory like they do so on the Web. This means they are applying their viewability and audience buying strategies to app campaigns; they're doing more geo-targeting in-app (with the more granular GPS info available). They're measuring and understanding the holistic impact of their App buys - on conversions that happen across their web sites and apps, across devices.").

[269] GOOG-NE-00112599 at -611. "Mobile Display Ads: Strategy and Planning" (May 2011). Internal Google document. ("Things will be very different when you're buying inventory in an app (where "app" is defined as an experience where you do, play, use rather than read, watch, consume), and when you're promoting an app. On the app inventory side, the formats won't just be banners. The ads will be more integrated into the app experience. And, when app developers are advertisers (i.e. when they're promoting their apps), they'll want a different set of tools and formats. Banners and CPC won't do.").

[270] GOOG-AT-MDL-001004706 at -713. "Ad Manager Ecosystem 101" (June 2019). Internal presentation introducing the ads ecosystem by gTech.

[271] GOOG-NE-02591152 at -390. "Travel Product Review" (October 34, 2019). Internal Google document summarizing meeting notes on publishers.

[272] GOOG-NE-02520428 at -428. "Apps as a First Class Citizen across Google Ads" (September 12, 2019). Internal document from Google Ads Product Strategy Offsite APSO 2018. ("For example, the mobile bid modifier in Google Ads makes no distinction between app and web clicks, even though conversion rates and ROI can differ significantly between the two.")

265. A 2016 Google presentation to MediaMath states: "[redacted]"[273] In 2018, Google itself ran an experiment to compare app and web conversion lift. The experiment looked at conversion characteristics between app and web for hybrid advertisers and found that conversion attributed to ad clicks in the experiment increased by [redacted] and that return on ad spend increased by a factor of [redacted].[274]

266. As in-app ads are shown on devices that are mobile in nature, advertisers are able to rely on data they usually don't have access to. This includes data linked to GPS information and device ID.[275] Moreover, Google mentions that app ads can "do much more" than display ads: "What's the difference between ads that run in an SDK in an app and ads that run on the web? The answer is, because the SDK can respond to these "special request" from the ad, ads being shown inside apps can do much more than ads being show in the browser."[276]

b) Ad buying tools for large advertisers are a distinct product market from ad buying tools for small advertisers

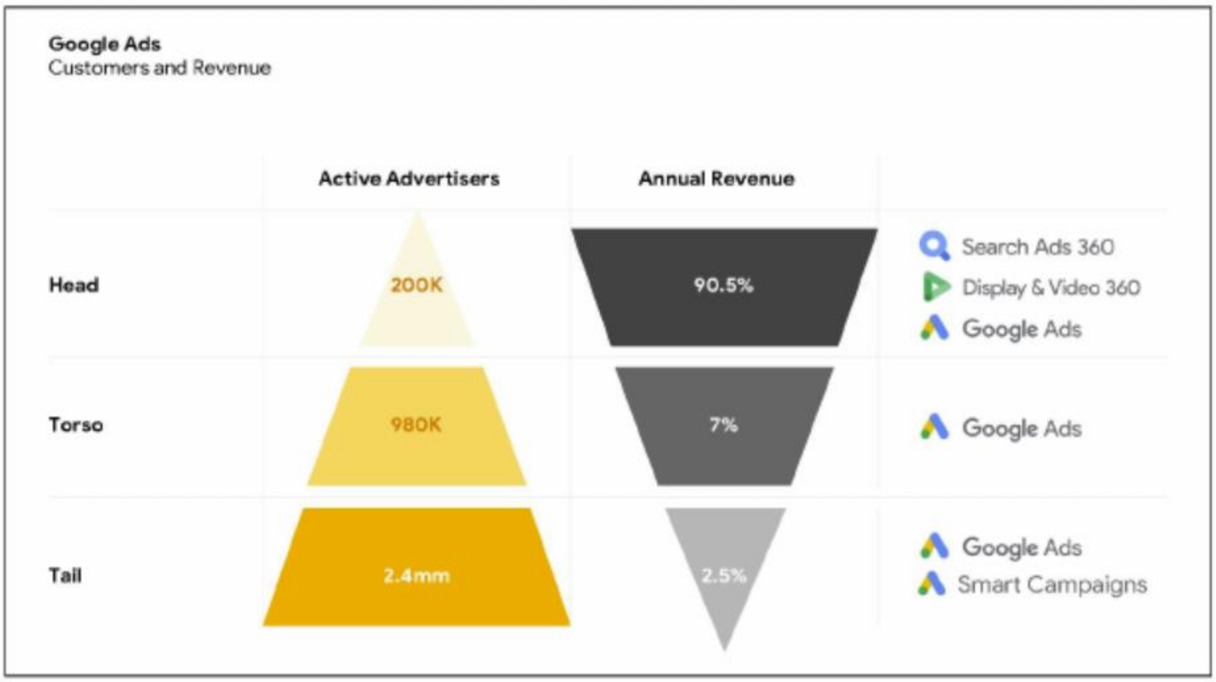
267. There are several important differences between small and large advertisers. A 2012 Google strategy document distinguished between three distinct advertiser segments: tail advertisers, torso advertisers, and head advertisers.[277] It attributes different offerings to these segments.[278] This differentiation amongst advertisers led Google to develop distinct products tailored to each segment's unique needs. Internal documents highlight that small and large advertisers use different Google tools to satisfy their advertising strategies. According to Google, small advertisers tend to use GDN,[279] and

[273] GOOG-TEX-01164279 at -370. "MediaMath AdX Strategic Business Planning Q1 2016" (March 10, 2016). Google presentation on strategic business planning for MediaMath.
[274] GOOG-NE-02520428 at -429. "Apps as a First Class Citizen across Google Ads" (September 12, 2019). Internal document from Google Ads Product Strategy Offsite APSO 2018. [redacted].
[275] GOOG-NE-00112599 at -611. "Mobile Display Ads": Strategy and Planning" (May 2011). Internal Google document. ("Mobile is different. The devices (screen size, portability), the technologies (HTML5 vs. Flash, App vs. Web), the data available (GPS, device ID), are all different from desktop.").
[276] GOOG-NE-00112599 at -605. "Mobile Display Ads": Strategy and Planning" (May 2011), page 7). Internal Google document.
[277] GOOG-NE-03869994 at -994. "GDN and DBM" (August 21, 2013). Internal Google document discussing how to help large display buyers to use GDN and DBM.
[278] GOOG-NE-03869994 at -994. "GDN and DBM" (August 21, 2013). Internal Google document discussing how to help large display buyers to use GDN and DBM.
[279] GOOG-TEX-00438280 at -304. "Display Business Overview" (November 2020). Google presentation on its display business. The slide shows the "display landscape" and show that small advertisers use GDN and Google Ads, while large advertisers use DBM.

Google Ads,[280] while large advertisers largely use DV360.[281] Google even acquired Invite Media in 2010 to develop a product targeted to the needs of large advertisers, separate and distinct from Google's already-existing buying tool for small advertisers.[282] The differences between small and large advertisers with distinct ad-buying products is well summarized by the 2014 Google chart.[283] It shows the display ads landscape and highlights that large and small advertisers use distinct ad buying tools.[284]

Figure 8

2019 Google presentation showing that large and small advertisers use different ad buying tools[285]



[280] GOOG-NE-05243813 at -849. "Display Strategy Working Document" (August 2012). Internal Google document explaining platforms and strategies. The document explains that AdWords is for tail and torso advertisers while head advertisers use DBM.
[281] GOOG-NE-07284897 at -910. "Display Ads Noogler Class GDN Overview" (November 2018). Internal Google presentation discussing GDN in the context of display ad ecosystem. The slide shows that DV360 is for networks, agencies, desks, and large advertisers. DV360 is da development of DBM, which also was intended for large advertisers. *See* GOOG-NE-05243813 at -849. "Display Strategy Working Document" (August 2012). Internal Google document explaining platforms and strategies. The document explains that AdWords is for tail and torso advertisers while head advertisers use DBM.
[282] GOOG-AT-MDL-008052561 at -565. "TrueView in DBM: Two platforms, one view" (October 2014). Internal Google PowerPoint presentation on DBM and GDN. ("A short while after buying Invite, a line was drawn in the sand - Invite (now called DoubleClick Bid Manager, or DBM) is intended for agency trading desks, GDN is a better fit for everybody else.").
[283] GOOG-NE-13207660 at -664. "DFP 101 (2016)" (September 6, 2016). Internal Google presentation of a top-down exploration of DFP.
[284] GOOG-NE-13207660 at -664. "DFP 101 (2016" (September 6, 2016). Internal Google presentation of a top-down exploration of DFP ("Pretend you are New York Times. Large sales team, selling digital and traditional inventory […] DFP's Business Model […] The publisher is in control").
[285] GOOG-NE-002217935 at -940. "Advertiser experience" (June 20, 2019). Google presentation on advertiser profiles and revenue on Google Ads.

268. There are several differentiating factors between ad buying tools for small advertisers and ad buying tools for large advertisers, such as pricing and unique features. Google Ads usually charges on a CPC basis; DV360 usually charges on a CPM basis.[286] Large ad buying tools give advertisers more control, whereas small ad buying tools provide more simplicity to access inventory.[287]

269. Small advertisers cannot use ad buying tools for large advertisers like DV360 because these tools have minimum spend requirements and include complex features small advertisers do not need.

270. Moreover, there are advantages to using Google Ads for particular ad campaigns, such as unique targeting data and algorithms.[288] As a result, ad buying tools for large advertisers are not reasonable substitute for all ad campaigns.

c) WGPs' ad buying tools are not participants in the relevant product market

271. WGPs' ad buying tools also do not participate in the ad-buying tools for buying open web display advertising. WGP ad buying tools are distinct from ad-buying tools for buying open web display advertising because they only enable advertisers to purchase ads on one specific publisher's website properties and not across the web. In-house tools, mediation tools, networks, in-app networks, and DSPs - despite enabling advertisers to purchase ad inventory - have distinct characteristics and serve distinct ad formats. Some WGP, such as Amazon or Facebook, offer ad buying tools to advertisers.

272. I analyzed Google data to assess whether display ad spend and spend on ads displayed on Amazon's website (a large shopping WGP) are substitutes for advertisers. I do so by analyzing changes in display ad spend via Google ad buying tools in months with and without the Amazon Prime Day – a positive shock to ad spend on Amazon's website. Advertisers purchased more Amazon ads during Prime Day months. If there was a substitution between WGP ad buying tools and display ad buying tools, a decrease in Google display ad spending would be expected. However, the analysis shows an increase in Google display ad spending during Prime Day months compared to the same months in other years

[286] GOOG-NE-02638997 at -002, -003. "DBM Optimization" (undated). Google presentation on ad buying tools for small and large advertisers. (Advertisers on Google Ads want "all the clicks they can get for less than maxCPC". while advertisers on DV360 want to maximize "all the impressions they can gel for less than maxCPM.").
[287] GOOG-TEX-00873439 at -439, 440. "Thoughts on Product/Advertiser Segmentation Around GDN & DBM" (October 25, 2013). Internal Google document discussing how to help advertisers to use GDN and DBM. ("Assuming we have the right org incentives and have created the correct GDN and DBM products that we envision (paternalistic v. control)").
[288] Deposition of [redacted] (Vice President of Engineering for Display and Video Ads at Google), 315:3 - 316:8, March 21, 2021. ("Q. I guess the thing that I'm trying to understand is, is it differentiated [demand on Google Ads] because of the targeting and targeting technology? Is it differentiated because it's using different data signals? Is it differentiated because it's using -- it has small advertisers that are able to buy programmatically through it? […] A. I mean, Tim, literally it's all of the above, right.")

without the Prime Day, after accounting for seasonality and the increasing ad spending trend. This result suggests little substitution between Amazon's Walled Garden ads and display ads for advertisers.[289]

273. WGP ad buying tools only operate within the publisher's owned and operated platform.[290] For instance, Amazon Ad Console cannot be used to display ads on third-party sites and, hence, is not a substitute for advertisers. An internal Amazon document defines this difference as such: "WGPs are closed ecosystems, as opposed to the 'open web' model publisher inventory is accessible through open marketplaces (exchanges, direct integrations etc.), such as A9's Amazon Ad Exchange (AAX). The industry has consolidated around a few key platforms (e.g., Facebook, YouTube, Snapchat, etc.). [redacted]"[291]

274. WGP ad buying tools are distinct from ad-buying tools for buying open web display advertising as they only enable advertisers to purchase ads on one specific publisher's website properties and not across the web.

275. [redacted][292] [redacted][293]

[289] RFP 20 data is used for this analysis. The "product" is filtered into "Google Ads" and "month" is between "2016-01" and "2022-12." "ad_spend_usd_web_display" is averaged across advertisers by month. I applied two approaches to identify shifts in advertisers' ad spending in Google, accounting for the increasing trend and seasonality of display ad spending. First, I used the Hodrick-Prescott filter to account for the cyclical variations in ad spending and compared ad spending in October 2020, with the Amazon Prime Day, to October in other years. Second, I calculated monthly display ad spending as a share of annual display ad spending to account for the yearly differences in total ad spending, then compared the shares in months with and without the Prime Day across years. RFP 20 provides data "for each of the 1000 largest users of Google Ads and DV360 with U.S. billing addresses" as described in 2023.05.30 D. Pearl Letter re Data Production.
[290] Amazon also owns a DSP. Amazon DSP is not considered a Walled Garden ad buying tools since it enables large advertisers to buy open web display ad inventory on properties other than Amazon's own properties.
[291] [redacted] 0160212 -215. [redacted]
[292] [redacted] 0160212 -212. [redacted]
[293] [redacted] 0160212 -215. [redacted]

276. The CMA report also sets apart specialized ads belonging to a vertical market and gives examples of Amazon in retail and Booking.com in travel.[294] The CMA distinguishes between an open display advertising market and an owned and operated platform. When looking at shares of expenditure, the CMA distinguishes between Open Display, Facebook, and other platforms such as Amazon, LinkedIn, TikTok, etc.[295]

F. There is a product market for ad buying tools for large advertisers for buying open web display advertising space ("ad buying tools for large advertisers")

277. Above I have defined a relevant market for ad buying tools for small advertisers for the buying of open web display advertising space. Obviously, there is a complementary market for large advertising tools purchasing open web display advertising, also called DSPs.

278. There are several important differences between large advertiser buyer tools and small advertiser buying tools. Ad buying tools for large advertisers offer a less automated approach for more sophisticated advertisers.[296]

279. Ad buying tools for large advertisers have large minimum spend requirements. For example, [redacted].[297]

280. Ad buying tools for large advertisers offer more complex features and a higher level of configurability that are not available to small advertisers. Larger advertisers tend to use DSPs to buy ad inventory and manage their ad campaigns. Google presents DV360 as "offering additional controls and

[294] Competition and Markets Authority. "Online platforms and digital advertising: Market study final report" para. 5.49 (July 1, 2020). https://assets.publishing.service.gov.uk/media/5efc57ed3a6f4023d242ed56/Final_report_1_July_2020_.pdf ("This section sets out our assessment of the current competitive constraints on Google and the extent to which it has market power in relation to search advertising. We consider in turn the competitive constraints from: other general search providers – notably Bing and its syndication partners; specialised search providers – such as Amazon and Booking.com; and display and other forms of advertising")

[295] Competition and Markets Authority. "Online platforms and digital advertising: Market study final report" Figure 5.9 (July 1, 2020). https://assets.publishing.service.gov.uk/media/5efc57ed3a6f4023d242ed56/Final_report_1_July_2020_.pdf

[296] Deposition of Eisar Lipkovitz (Vice President of Engineering for Display and Video Ads at Google), March 31, 2021, 88:13-90:2. ("DSPs end up being these very complex super features that, in order to run a campaign, you need to have somebody super knowledgeable")

[297] [redacted]0002412 at -412. [redacted]

the ability for advertisers to source their own inventory."[298] I describe ad buying tools for large advertiser in Section IV.F below.

281. [redacted], Director of Product Management at Google, explains that both products offer distinct characteristics and serve particular use cases: "GDN and DBM need to have different set of features and controls. […] it makes little sense to design the two products to have complete feature and control parity. Doing so essentially creates unnecessary duplicity, and more importantly it is a huge, missed opportunity to create differentiated products to service different classes of advertisers."[299]

282. Large advertisers sometimes use ad buying tools for small advertisers in order to more effectively purchase certain types of advertising. Large advertisers multi-home across ad buying tools for small advertisers and ad buying tools for large advertisers to capture complementary ad types. However, they typically single-home for any specific ad campaign.[300] As a result, depending on the size of the advantage of the ad buying tool for small advertisers, large advertisers may not completely substitute ad buying tools for small advertisers for ad buying tools for large advertisers.

283. Google acknowledges that some large advertisers choose to use ad buying tools for small advertisers for their various advertising goals.[301] [redacted], Director of Product Management at Google, explains: "GDN and DBM are not competitive. They're complementary."[302] Google defines this as "media buying fragmentation", which leads advertisers to "purchas[e] different buckets of media

---

[298] GOOG-NE-07284897 at -910. "Display Ads Noogler Class GDN Overview" (November 2018). Internal Google presentation discussing GDN in the context of display ad ecosystem.

[299] GOOG-TEX-00873439 at -439. "Thoughts on Product/Advertiser Segmentation Around GDN & DBM"." (October 25, 2013). Internal Google document discussing how to help advertisers to use GDN and DBM.

[300] Competition and Markets Authority. "Online platforms and digital advertising: Market study final report" para. 5.219 (July 1, 2020). https://assets.publishing.service.gov.uk/media/5efc57ed3a6f4023d242ed56/Final_report_1_July_2020_.pdf. ("Although larger advertisers and media agencies often use multiple DSPs across advertising campaigns, typically a single DSP is used for a given campaign, as this allows the advertiser to manage frequency caps over the entire campaign and facilitates audience management and reporting. Some of the large advertisers we engaged with during this study told us that they used a single main DSP across all their campaigns.").

[301] GOOG-NE-05243813 at -851. "Display Strategy Working Document" (August 2012) Internal Google document explaining platforms and strategies. (The document explains that "only a small subset of buyers "truly need both products [DBM and GDN]").

[302] GOOG-TEX-00873439 at -439. "Thoughts on Product/Advertiser Segmentation Around GDN & DBM"." (October 25, 2013). Internal Google document discussing how to help advertisers to use GDN and DBM.

through different DSPs, networks, and channels."[303] Google has a playbook for advertisers to "best leverage Google Ads and DV360 Together"[304]

284. Ad buying tools for large advertisers can transact several types of advertising such as display advertising, in-app advertising, video advertising, Connected TV advertising, and direct deals. Large advertisers use DSPs for several purposes, including connecting with exchanges and sellers of ad inventory, optimizing demographic and cross device targeting, managing advertising campaigns and remarketing campaigns, handling fraud and brand safety, managing campaign performance.

285. Ad buying tools for large advertisers allow large advertisers to connect to exchanges or directly to sellers that provide ad inventory. Large advertisers use these tools to purchase ads to fulfil their campaign goals (i.e., optimizing their targeting and impact within their campaign budget). DSPs offer complex features and a high level of configurability. Large advertisers tend to use DSPs to buy ad inventory and manage their ad campaigns. DSPs are a technology layer that enables advertisers to set parameters, like maximum bid price, to programmatically (i.e., automatically) buy individual impressions from across multiple sources through a single interface.[305]

286. Google's DSP is called DV360. DV360 was formerly known as DoubleClick Manager (DBM). Today, other market participants include The Trade Desk, Criteo, Adobe, Version Media, Xandr, and Amazon's DSP.

287. Producers of ad buying tools for large advertisers charge large advertisers a license fee based on media spend. Different large advertisers can be charged different amounts and costs can vary based on add-ons, specific campaigns characteristics, and advertising type. The media cost structure for DSP is usually on a Cost Per Mille (CPM) basis, which is the average price paid to deliver 1,000 ad impressions.

[303] GOOG-AT-MDL-006787342 at -369. "CG&E M&A Programmatic Training" (January 27, 2022). Google presentation for an internal training on programmatic topics. ("This often results in is media buying fragmentation– purchasing different buckets of media through different DSPs, networks, and channels. Maybe an advertiser loves the CTV offerings from The Trade Desk, our fiercest DSP competitor, they buy all their CTV through The Trade Desk. They also love YouTube and buy YouTube through Google Ads. And they always negotiate a yearly deal with New York Times that they buy directly with the publisher outside of a DSP.").
[304] GOOG-AT-MDL-006823531 at -535. "Google Ads and DV360: Playbook for Strategy and Activation" (Q4 2022). Google presentation on how to use Google Ads and DV360 together.
[305] AdButler. "What is a Demand-Side Platform (DSP)? How DSPs Work Explained" (April 23, 2021). Accessed on May 10, 2024. https://www.adbutler.com/blog/article/what -is-a-demand-side-platform-dsp ("A demand-side platform (DSP) is a software system used by advertisers to manage the buying of digital ad space from across multiple ad exchanges through a single interface.").

DSPs usually have a commitment to spend at least a minimum monthly amount.[306] Google's DSP, DV360, charges advertisers a tech fee in addition to a percentage of spend per month.[307]

288. Based on the same approaches (e.g., Brown Shoe and HMT) and for the same reasons that I evaluated above to find a relevant market for ad buying tools for small advertisers for the buying of open web display advertising space, I also find a complementary market for large advertising tools purchasing open web display advertising. My analysis regarding small advertiser ad buy tools applies equally here.

G. The relevant geographic dimension for all product markets is the U.S.

289. In this section, I explain that the relevant geographic market for assessing the challenged conduct is the United States. By this, I mean that when Google exercises market power in any of the relevant markets defined in this report, it does so in the United States and not necessarily in any other country.[308] The competitive landscape in each country is different because of the result of cultural/linguistic, technological, and regulatory differences.[309] The price, the competitors, and the demand can be different in different geographies.[310] This conclusion applies to the market for publisher ad servers, ad exchanges, ad buying tools for small and large advertisers.

290. Advertising transacted through publisher ad servers, exchanges, and ad buying tools is specific to the target audience. Website users outside the U.S. do not participate in these markets, and users in the U.S. do not utilize these markets in other geographies. An advertiser tailors its advertising campaign to its audience and customizes its ads to customer preferences across geographies. For instance, Coca-Cola customized its globally known messaging of "dreaming of a brighter future" to the Egyptian local market

[306] For instance, Amazon requires a $35,000 spend for Amazon Managed Services DSP. *See* Aihello. "Amazon sponsored ads vs DSP" (undated). Accessed on May 10, 2024. https://www.aihello.com/resources/blog/amazon-sponsored-ads-vs-dsp/.
[307] GOOG-AT-MDL-B-004284105 at -130. "Google's Advertising Technology Business" (September 10, 2019). Google's presentation about Google's advertising technology business, evolution of the adtech ecosystem, impression-based bidding, and the adtech ecosystem today, at U.S. Department of Justice, Antitrust Division. ("Advertisers/agencies pay Google a tech fee in addition to a percentage of spend/month.").
[308] GOOG-NE-06732710 at -714. "DFP Fees on Google-monetized impressions" (July 9, 2012). Internal Google presentation on DFP pricing. ("note: DFP's ad-serving prices are based off a global rate card with small variations by region […] in countries with lower average media CPMs, publishers struggle to see the relative value of DFP.")
[309] "Merger Guidelines" Section 4.3.d. U.S. Department of Justice and the Federal Trade Commission. Issued "Merger Guidelines" Section 4.3d (December 18, 2023. https://www.justice.gov/d9/2023-12/2023%20Merger%20Guidelines.pdf. The Merger Guidelines explain "Factors that may limit the geographic scope of the market include transportation costs, language, regulation, tariff and non-tariff trade barriers, custom and familiarity, reputation, and local service availability."
[310] GOOG-NE-06732710 at -714. "DFP Fees on Google-monetized impressions" (July 9, 2012). Internal Google presentation on DFP pricing. ("DFP's ad serving costs tend to be higher than the competition (1.5 to 2X) and (particularly outside NA) publishers struggle to see justification for that level of premium (note: DFP's ad serving prices are based off a global rate card with small variations by region – some large publishers have multi-jurisdictional entities and a s a result we strive to maintain consistency of pricing across regions in order to protect against cannibalization of rates. However, in countries with lower average CPMs, publishers struggle to see the relative value of DFP)").

by reflecting the socio-economic reality of the Arab Spring uprisings. Similarly, a publisher will want to improve its users' experience on its website by proposing tailored content.

291. From a technological perspective, geographies outside the U.S. can lead to network latency. For this reason, competitors in these markets must have local equipment. This means further that the competitors can differ in each geography. Geographically dispersed server strategies enable the improvement of the loading speed of web pages. By reducing the distance between servers and users, the time required to transmit data between the server and the user is significantly reduced. Increasing the distance between the server and the user can increase loading time by a couple of milliseconds. All other things being equal (routing efficiency, processing overhead, congestion, etc.), the distance delay may result in slower loading. Any increase in loading time may cause frustration and a decrease in user experience. Google acknowledges that "users suffer from latency and a poor experience."[311] Reduced latency translates into a better user experience and higher visitor retention. Google explains that: "publishers suffer from high latency and user session drop off."[312] Many publishers aim to maximize user experience to increase the time spent on their properties to sell their ad inventory at higher prices. Publishers, hence, usually make decisions to improve user experience and decrease loading time.

292. Finally, publishers and advertisers using ad servers, exchanges, or ad buying tools are subject to distinct regulatory limitations across geographies. In particular, regulations around user privacy and advertising deceptive trade practices vary from country to country. For instance, in the European Union, the General Data Protection Regulation (GDPR) guidelines affect how marketers can use behavioral data collection.[313] Publishers and advertisers, hence, need to operate differently in distinct countries and can often not substitute between geographic markets without incurring significant legal risks.

[311] GOOG-NE-03872763 at -789. "Discussion on improving AdX & AdSense backfill" (May 12, 2014). Internal Google presentation on how to improve AdX and AdSense backfill. (The presentation slide describes the "current market situation," and one bullet point shows "publishers suffer from high latency and user session drop off.").
[312] GOOG-NE-03872763 at -789. "Discussion on improving AdX & AdSense backfill" (May 12, 2014). Internal Google presentation on how to improve AdX and AdSense backfill. (The presentation slide describes the "current market situation," and one bullet point shows "users suffer from latency and a poor experience.").
[313] Forbes. "How Does GDPR Impact Advertising And E-Commerce?" (May 8, 2018). Accessed on May 10, 2024. https://www.forbes.com/sites/forbesagencycouncil/2018/05/08/how-does-gdpr-impact-advertising-and-e-commerce/?sh=416c98bf3277 ("[…] consumers are overwhelmed and wary of advertisements that are chasing them everywhere, and advertisers waste 60% of their advertising dollars. But now, the EU is choosing to crack down on iniquitous practices in its new General Data Protection Regulation (GDPR) guidelines, which will make this ubiquitous form of advertising impossible. With it, EU users regain control over their data by obtaining the right to access their data, object to data processing and the right to be "forgotten." […] For U.S. companies, this means you can't ask your European consumers to subscribe to a research study and then send product advertisements to them, and you can't push ads based on their search history.")

V. GOOGLE HAS MONOPOLY POWER IN THE MARKETS FOR PUBLISHER AD SERVERS, AD EXCHANGES, AND AD-BUYING TOOLS FOR SMALL ADVERTISERS

293. In this section of the report, I assess whether Google has monopoly power in three relevant product markets: (1) the market for publisher ad servers used for the sale of open web display advertising, (2) the market for ad exchanges for transacting indirect open web display advertising, and (3) the market for ad-buying tools for small advertisers for buying open web display advertising. I evaluate whether and find that Google has monopoly power in each of these markets.

294. My analysis proceeds as follows. I start by defining the key, accepted economic principles of identifying monopoly power in a relevant antitrust market. I then apply those methods and principles to assess each of the three markets. I analyze market shares, barriers to entry, pricing and the entry/exit of competitors in each market over time.

A. Monopoly power is demonstrated by examination of a host of variables

295. In economics, "monopoly power" is a term that is often used interchangeably with the term "market power."[314] Market power is the ability to price a product above the competitive level, reduce quality, service and/or innovation below the competitive level, or exclude competition.[315] A firm will have substantial market power in a market if it is not constrained in its behaviors by incumbent providers or by the potential for entry by new providers. Economists use monopoly power would be used to describe market power that is substantial. In what follows, I will use the term "monopoly power" in place of the term "substantial market power."

296. The benchmark for competition is based on the economic theory of competitive outcomes. That theory says that if no firms in a market have monopoly power, then prices will be approximately equal to costs. In the short run, the price will reflect marginal costs. In the long run, if production involves fixed costs, the price will reflect long-run average costs. The prediction here is that in competitive markets,

[314] Waldman and Jensen. "*Industrial Organization Theory and Practice*". 3rd Edition. p.64. ("Any firm that has the ability to set price above marginal cost, the perfectly competitive equilibrium price, is said to have ***market power*** or *monopoly power*."); Carlton & Perloff. "*Modern Industrial Organization*". 2nd Edition. p. 137. ("Whenever a firm can influence the price it receives for its product, the firm is said to have *monopoly power* (sometimes called *market power*). The terms *monopoly power* and *market power* typically are used interchangeably to mean the ability to profitably set price above competitive levels […]"); Kenneth G. Elzinga and David E. Mills, "The Lerner Index of Monopoly Power: Origins and Uses," American Economic Review 101, no. 3 (2011), 560 ("In antitrust, the degree of monopoly is not measured by an index so much as it is indicated by a variety of factors-such as market concentration, barriers to entry, and the particular conduct of the firm in question. Antitrust enthrones no single quantitative measure.").

[315] Federal Trade Commission "Monopolization Defined" (undated). Accessed on May 10, 2024. https://www.ftc.gov/advice-guidance/competition-guidance/guide-antitrust-laws/single-firm-conduct/monopolization-defined; U.S. Department of Justice. "Monopoly Power and Market Power in Antitrust Law" (January 3, 2024). Accessed on May 10, 2024. https://www.justice.gov/archives/atr/monopoly-power-and-market-power-antitrust-law

providers will adjust their actions in order to maximize profits, but that this will come at the expense of the profits of rivals. When all firms are pursuing such actions, profits will be "competed away." In the process, firms will earn minimal profits to make it worthwhile to continue operating in the market, while consumers will receive the benefits from that competition in terms of lower prices, productive efficiency, keeping costs (and prices) low and higher rates of innovation and optimal levels of product quality.

297. It is possible to determine monopoly power from evidence of output restrictions, bargaining strength, and supracompetitive prices or profits.[316] An inference of monopoly power also exists when there are -- high market shares and barriers to entry.[317] With respect to constraints by incumbent providers, a firm will be able to raise prices if it has a relatively high productive capacity, has some unique ability to supply attractive product features, has consumers that face costs in switching to other providers and controls network effects. These factors can be evaluated by analyzing the market shares of providers in the market in conjunction with evidence of other factors.

1) The interpretation of market share evidence

298. Market share refers to the proportion of total sales or output in a market that is accounted for by a particular firm.[318] The purpose of market share is to indicate a firm's future competitive significance. Various metrics can define market shares. Many economists recommend calculating market shares based on actual sales or revenue when products are differentiated and on capacity when they are not.[319] Competitors' market shares can also help inform monopoly power. A dominant firm's monopoly power is reinforced if the rest of the market is highly fragmented.[320]

299. Evidence of market shares can be used to assess a firm's monopoly power in a given market. Market share refers to the proportion of total sales or output in a market that is accounted for by a particular firm.[321] A high market share can be an indication of monopoly power, as it suggests that the firm has a significant presence in the market and may be able to influence prices or output.[322]

[316] Rebel Oil Co., Inc. v. Atlantic Richfield, Co., 51 F.3d 1421 (1995), 1435 (9th Cir.). ("One type of proof is direct evidence of the injurious exercise of market power. If the plaintiff puts forth evidence of restricted output and supracompetitive prices, that is direct proof of the injury to competition which a competitor with market power may inflict, and thus, of the actual exercise of market power.")
[317] OECD. "Evidentiary Issues in Proving Dominance" pg. 26-37 (2006). https://www.oecd.org/competition/abuse/41651328.pdf
[318] Tirole, Jean. *The Theory of Industrial Organization*. 1st ed., MIT Press, 1988.
[319] Shapiro, Carl. "Mergers with differentiated products." *Antitrust Division U.S. Department of Justice*. 1995.
[320] Landes, William M., & Posner, Richard A. "Market Power in Antitrust Cases." *Harvard Law Review*, vol. 94, no. 5, 1981, pg. 937-996.
[321] Tirole, Jean. *The Theory of Industrial Organization*. 1st ed., MIT Press, 1988.
[322] Motta, Massimo. *Competition Policy: Theory and Practice.* 1st ed., Cambridge University Press, 2004.

300. Relevant metrics that indicate proportion of total sales and output in the ad tech industry include impressions, overall spend, user count, and domain count. These metrics are indicative of the importance of the ad tech provider and competitive advantage the provider possess in the relevant market.

301. Competitors' market shares can also help identify monopoly power. A dominant firm's monopoly power is reinforced if the rest of the market is highly fragmented.[323] Evidence of market shares can be obtained from various sources, such as industry reports, and company internal documentation. The ideal metrics of market share for all three relevant product markets where Google has monopoly power in this report are: (i) the share of total market revenues (or ad spend) and (ii) the share of total market transactions (i.e., impressions routed by ad servers, impressions transacted by exchanges, and impressions bought by buying tools). In the absence of these metrics, other metrics, such as the number of customers of each tool, serve as indicative evidence.

2) Evidence of unique product features

302. A firm that has access to unique product features can possess market power in a given market. Unique product features refer to characteristics or attributes of a product that are not available in competing products, such as superior performance, exclusive functionality, or proprietary technology.[324] When a firm has access to unique product features, it can differentiate its product from those of its competitors and create a perception of higher value among consumers.[325] This can lead to increased consumer loyalty, reduced price sensitivity, and the ability to charge higher prices or capture a larger market share.[326] Evidence of unique product features can be found in various forms, such as patents, trademarks, copyrights, and trade secrets.[327] For example, in the pharmaceutical industry, a firm may have a patent on a new drug that treats a specific condition more effectively than existing drugs, giving it a unique product feature and a degree of market power.[328] Similarly, in the technology industry, a firm may have proprietary software or algorithms that provide superior performance or functionality compared to competing products, such as Google's search algorithms or Apple's iOS operating system.[329] These

[323] Landes, William M., & Posner, Richard A. "Market Power in Antitrust Cases." *Harvard Law Review*, vol. 94, no. 5, 1981, pg. 937-996.
[324] Pepall, Lynne, Richards, Dan, & Norman, George. *Industrial Organization: Contemporary Theory and Empirical Applications*. 5th ed., Wiley, 2014.
[325] Tirole, Jean. *The Theory of Industrial Organization*. 1st ed., MIT Press, 1988.
[326] Besanko, David., Dranove, David., Shanley, Mark., & Schaefer, Scott. Economics of Strategy. 7th ed., Wiley, 2017.
[327] Scotchmer, Suzanne. *Innovation and Incentives*. 1st ed., MIT Press, 2004.
[328] Caves, Richard E., Whinston, Michael D., & Hurwitz, Mark A. "Patent expiration, entry, and competition in the U.S. pharmaceutical industry." *Brookings Papers on Economic Activity. Microeconomics*, 1991, pg. 1-66.
[329] Varian, Hal R. "Computer mediated transactions." *American Economic Review*, vol. 100, no. 2, 2010, pg. 1-10.

unique product features, supported by evidence such as patents or observable technological superiority, can be an indication of a firm's market power in its respective market.

3) The impact of customer switching costs

303. When consumers face costs when switching to other providers, a firm can charge those consumers higher prices and be insulated from competition as a result. In addition, when customers can't switch, it makes entry difficult. Evidence of switching costs can be an indication that a firm possesses monopoly power in a given market. Switching costs refer to the costs that consumers incur when they switch from one product or service to another, such as the time and effort required to learn how to use a new product, the cost of transferring data or files, or the loss of loyalty rewards or discounts.[330] When switching costs are high, consumers may be less likely to switch to a competitor's product, even if the competitor offers a lower price or better quality. This can give the incumbent firm a degree of market power, as it can raise prices or reduce quality without losing a significant number of customers.[331] Evidence of switching costs can be found in various forms, such as long-term contracts, loyalty programs, proprietary file formats or software, and network effects.[332] For example, in the mobile phone industry, consumers may face high switching costs due to long-term contracts, the need to transfer contacts and data, and the loss of app purchases and settings when switching to a different operating system.[333] Similarly, in the software industry, users may face high switching costs due to the need to learn new software, convert files to a new format, and rebuild customizations and integrations.[334] These examples, supported by the academic literature, demonstrate how evidence of switching costs can be an indication of a firm's market power.

4) The impact of network effects

304. A firm that controls a product or platform with network effects can possess significant market power. Network effects occur when the value of a product or service increases as more people use it, creating a positive feedback loop that can lead to market dominance.[335] (In the presence of strong network effects, a firm that controls a widely adopted product or platform may be able to maintain its market

[330] Klemperer, Paul. "Competition when consumers have switching costs: An overview with applications to industrial organization, macroeconomics, and international trade." *The Review of Economic Studies*, vol. 62, no. 4, 1995, pg. 515-539.
[331] Farrell, Joseph, & Klemperer, Paul. "Coordination and lock-in: Competition with switching costs and network effects." *Handbook of Industrial Organization*, vol. 3, 2007, pg. 1967-2072.
[332] Shapiro, Carl, & Varian, Hal R. *Information Rules: A Strategic Guide to the Network Economy*. Harvard Business Press, 1999.
[333] Shy, Oz. "A quick-and-easy method for estimating switching costs." International Journal of Industrial Organization, vol. 20, no. 1, 2002, pg. 71-87.
[334] Liebowitz, Stan J., & Margolis, Stephen E. "Path dependence, lock-in, and history." *Journal of Law, Economics, & Organization*, vol. 11, no. 1, 1995, pg. 205-226.
[335] Katz, Michael L., & Shapiro, Carl. "Network externalities, competition, and compatibility." *The American Economic Review*, vol. 75, no. 3, 1985, pg. 424-440.

position even in the face of competition, as users may be reluctant to switch to a rival product with a smaller user base.[336] This can create barriers to entry for new competitors and allow the incumbent firm to exercise market power by raising prices, reducing quality, or limiting innovation.[337] Evidence of network effects can be found in various forms, such as user data, market share, and customer switching costs. For example, in the social media industry, platforms like Facebook and Twitter exhibit strong network effects, as the value of the platform to each user increases with the number of other users on the platform.[338] The market power of these firms can be assessed by examining data on user engagement, such as the number of monthly active users, the average time spent on the platform, and the number of interactions between users.[339] Similarly, in the software industry, products like Microsoft Office and Adobe Creative Suite benefit from network effects, as the widespread adoption of these products creates a self-reinforcing cycle of increased compatibility, file sharing, and user familiarity.[340] The monopoly power of these firms can be evaluated by analyzing data on market share, customer switching costs, and the presence of viable alternatives in the market.[341] These examples, supported by empirical evidence and academic literature, demonstrate how a firm that controls a product or platform with network effects can possess market power.

5) Evidence of barriers to entry

305. Barriers to entry can reflect the existence of market power. Entry by new participants can occur when there are profit opportunities that the new participants can compete for in the market. Where entry is not difficult, costly, or risky, new entrants can combat market power or render an exercise of market power short-lived. Thus, a firm's market power over the long run can be assessed by considering the extent to which entry barriers exist.

306. A barrier to entry is any factor that makes it difficult or costly for new firms to enter a market and compete with incumbent firms, thereby protecting the market power of the incumbents.[342] The factors contributing to a lack of internal constraint on an incumbent firm can also be a constraint on external

[336] Farrell, Joseph, & Klemperer, Paul. "Coordination and lock-in: Competition with switching costs and network effects." *Handbook of Industrial Organization*, vol. 3, 2007, pg. 1967-2072.
[337] Rochet, Jean-Charles, & Tirole, Jean. "Platform competition in two-sided markets." *Journal of the European Economic Association*, vol. 1, no. 4, 2003, pg. 990-1029.
[338] Cusumano, Michael A., Gawer, Annabelle, & Yoffie, David B. *The Business of Platforms: Strategy in the Age of Digital Competition, Innovation, and Power*. Harper Business, 2019.
[339] Tucker, Catherine. "Network effects and market power: What have we learned in the last decade?" *Antitrust*, vol. 32, no. 2, 2018, pg. 77-81.
[340] Shapiro, Carl, & Varian, Hal R. *Information Rules: A Strategic Guide to the Network Economy*. Harvard Business Press, 1999.
[341] Brynjolfsson, Erik, & Kemerer, Chris F. "Network externalities in microcomputer software: An econometric analysis of the spreadsheet market." *Management Science*, vol. 42, no. 12, 1996, pg. 1627-1647.
[342] Bain, Joe S. *Barriers to New Competition*. Harvard University Press, 1956.

participants. Barriers to entry can arise from various additional sources, such as economies of scale, capital requirements, product differentiation, switching costs, and government regulations.[343] When entry barriers are high, incumbent firms may be able to maintain their market position and profitability without facing significant competitive pressure, as potential entrants are deterred or prevented from entering the market.[344] This can allow incumbent firms to exercise market power by raising prices, reducing quality, or limiting output.[345]

307. Evidence that would support the conclusion that entry barriers are high can be found in various forms, depending on the specific industry and context. Some examples include:

308. High capital requirements: If entering a market requires significant upfront investments in equipment, facilities, or research and development, this can create a barrier to entry. Evidence of high capital requirements can be found in financial statements, industry reports, and expert testimony.[346]

309. Economies of scale: If incumbent firms benefit from significant cost advantages due to their large scale of production, this can create a barrier to entry for smaller competitors. Evidence of economies of scale can be found in production data, cost analyses, and academic studies.[347]

310. Government regulations: If government regulations, such as licensing requirements, intellectual property protections, or zoning restrictions, make it difficult or costly for new firms to enter a market, this can create a barrier to entry. Evidence of regulatory barriers can be found in legal documents, government publications, and expert testimony.[348]

311. Evidence that would support the conclusion that entry barriers are high can be found in various forms, depending on the specific industry and context. Some examples include:

312. By examining evidence from these and other relevant sources, economists and policymakers can assess the height of entry barriers in a given market and evaluate the extent to which incumbent firms are protected from competition and able to exercise market power.

[343] Porter, Michael E. *Competitive Strategy: Techniques for Analyzing Industries and Competitors*. Free Press, 1980.
[344] Stigler, George J. *The Organization of Industry*. University of Chicago Press, 1968.
[345] Demsetz, Harold. "Barriers to entry." *The American Economic Review*, vol. 72, no. 1, 1982, pg. 47-57.
[346] Spence, A. Michael. "Notes on advertising, economies of scale, and entry barriers." *The Quarterly Journal of Economics*, vol. 95, no. 3, 1980, pg. 493-507.
[347] Scherer, F. M., & Ross, David. *Industrial Market Structure and Economic Performance.* 3rd ed., Rand McNally, 1990.
[348] Stigler, George J. "The theory of economic regulation." *The Bell Journal of Economics and Management Science*, vol. 2, no. 1, 1971, pg. 3-21.

313. Patterns of entry and exit can also be used to assess whether there are increasingly high barriers to entry in a market. In a competitive market with low barriers to entry, firms are expected to enter when there are profitable opportunities and exit when they face persistent losses.[349] However, if barriers to entry are high and increasing, the rate of entry may decrease over time, while the rate of exit may remain stable or increase.[350] This pattern can be an indication that incumbent firms are becoming more entrenched and protected from competition, as potential entrants are deterred by the growing costs and challenges of entering the market.[351]

314. Evidence of increasingly high barriers to entry can be found by analyzing data on firm entry and exit over time. Some examples include:

315. Declining entry rates: If the number of new firms entering a market decreases consistently over time, this may suggest that barriers to entry are increasing. Evidence of declining entry rates can be found in business registration data, industry reports, and academic studies.[352]

316. Persistent market concentration: If the market shares of the largest firms remain stable or increase over time, despite the entry of new competitors, this may indicate that barriers to entry are high and preventing new firms from gaining a foothold. Evidence of persistent market concentration can be found in market share data, concentration ratios, and Herfindahl-Hirschman Indices (HHIs).[353]

317. Increasing average firm size: If the average size of firms in a market increases over time, this may suggest that economies of scale are becoming more important and creating barriers to entry for smaller competitors. Evidence of increasing average firm size can be found in firm-level data on employment, output, or assets.[354]

318. Stable or increasing exit rates: If the rate of firm exit remains stable or increases over time, despite declining entry rates, this may indicate that incumbent firms are facing less competitive pressure

[349] Geroski, Paul A. "What do we know about entry?" *International Journal of Industrial Organization*, vol. 13, no. 4, 1995, pg. 421-440.
[350] Dunne, Timothy, Roberts, Mark J., & Samuelson, Larry. "Patterns of firm entry and exit in U.S. manufacturing industries." *The RAND Journal of Economics*, vol. 19, no. 4, 1988, pg. 495-515.
[351] Siegfried, John J., & Evans, Laurie Beth. "Empirical studies of entry and exit: A survey of the evidence." *Review of Industrial Organization*, vol. 9, no. 2, 1994, pg. 121-155.
[352] Orr, Dale. "The determinants of entry: A study of the Canadian manufacturing industries." *The Review of Economics and Statistics*, vol. 56, no. 1, 1974, pg. 58-66.
[353] Besanko, David., Dranove, David., Shanley, Mark., & Schaefer, Scott. *Economics of Strategy*. 7th ed., Wiley, 2017.
[354] Sutton, John. *Sunk Costs and Market Structure: Price Competition, Advertising, and the Evolution of Concentration*. MIT Press, 1991.

and are able to maintain their market position. Evidence of stable or increasing exit rates can be found in business closure data, bankruptcy filings, and academic studies.

319. By examining these and other relevant patterns of entry and exit, economists and policymakers can assess whether barriers to entry are increasing in a given market and evaluate the extent to which incumbent firms are becoming more protected from competition over time. This analysis can inform regulatory decisions, antitrust enforcement, and policy interventions aimed at promoting competition and economic efficiency.

6) The ability of consumers to exercise informed choice

320. As a final point, it is worth emphasizing how important consumer choice is. Consumer choice is critical in enabling competition and ensuring that no one firm has market power. When consumers have clear information about the prices and quality of products offered by different firms, they are able to make informed decisions and choose the options that best meet their needs and preferences.[355] This consumer sovereignty puts pressure on firms to compete by offering lower prices, higher quality, or innovative features, as they know that consumers can easily switch to a rival's product if they are not satisfied.[356] In this way, consumer choice acts as a check on the monopoly power of individual firms and promotes competitive outcomes.

321. Clear price transparency, both for the firm in question and actual and potential competitors, is essential for enabling effective consumer choice. When prices are easily observable and comparable across firms, consumers can quickly identify the best deals and make informed purchasing decisions.[357] This price transparency also makes it harder for firms to engage in anticompetitive practices, such as price discrimination or collusion, as any attempts to charge higher prices or coordinate with rivals would be readily apparent to consumers.[358]

322. An illustrative example of the importance of consumer choice and price transparency can be found in the online travel booking industry. Platforms like Expedia, Booking.com, and Kayak aggregate information on prices and availability from various airlines, hotels, and rental car companies, allowing

[355] Stigler, George J. "The economics of information." *Journal of Political Economy*, vol. 69, no. 3, 1961, pg. 213-225.
[356] Becker, Gary S. "Irrational behavior and economic theory." *Journal of Political Economy*, vol. 70, no. 1, 1962, pg. 1-13.
[357] Salop, Steven, & Stiglitz, Joseph. "Bargains and ripoffs: A model of monopolistically competitive price dispersion." *The Review of Economic Studies*, vol. 44, no. 3, 1977, pg. 493-510.
[358] Varian, Hal R. "A model of sales." *The American Economic Review*, vol. 70, no. 4, 1980, pg. 651-659.

consumers to compare options and find the best deals easily.[359] (Clemons, Hann, & Hitt, 2002). This price transparency has intensified competition among travel providers, as they know that consumers can quickly switch to a cheaper or better alternative if they are not satisfied with the offered prices or services.

323. In this example, the monopoly power of individual airlines, hotels, or rental car companies is limited by the ability of consumers to compare prices and make informed choices easily. If a particular firm were to raise its prices above competitive levels or offer subpar service, consumers would quickly become aware of this through the price comparison platforms and switch to a rival provider. This threat of consumer switching puts pressure on firms to maintain competitive prices and quality, even if they have a large market share or a well-established brand. This demonstrates how consumer choice, enabled by clear price transparency, is critical for promoting competition and limiting the monopoly power of individual firms. By ensuring that consumers have access to the information they need to make informed decisions, policymakers and regulators can help to create a more competitive and efficient market environment that benefits both consumers and firms.

324. I analyze market shares in the publisher ad server, the ad exchange, and the ad buying tool for small advertisers markets as evidence of Google's monopoly power in these markets across the relevant time period in the U.S. The ideal metrics of market share for all three relevant product markets in which Google has monopoly power are: (i) the share of total market revenues (or ad spend) and (ii) the share of total market transactions (i.e., impressions routed by ad servers, impressions transacted by exchanges, and impressions bought by buying tools). In the absence of these metrics, other metrics, such as the number of customers of each tool, serve as complementary evidence.

B. A primer of data targeting advantages

325. Because data plays such a critical role in the advertising industry, before considering the evidence of Google's monopoly power in the relevant markets, it is instructive to consider precisely how data can confer advantages in advertising as this provides a critical context to understand Google's intent and effect in its conduct as well as some of the intangible sources of its monopoly power. As will be shown below in the analysis of that conduct (particularly, "auction manipulations" in Section VIII), Google's motives in manipulating auction outcomes were driven by concerns regarding information flowing to market participants and competitors, it is instructive to consider, first, in detail, the role of data and information in the competitive operation of markets.

[359] Clemons, Eric K., Hann, Il-Horn, & Hitt, Lorin M. "Price dispersion and differentiation in online travel: An empirical investigation." *Management Science*, vol. 48, no. 4, 2002, pg. 534-549.

326. In the context of digital display advertising markets, data targeting refers to the ability of publishers or advertising platforms that support them to identify the characteristics of users and match them with the profiles or personas that advertisers would like to reach. An advertisement is effective if when a person views an ad, they are more likely to purchase the advertised product. Therefore, for the vast majority of ads, if that ad is placed in front of a random individual, it is improbable that the individual will want to purchase the product being advertised. This mismatch of an ad to a user is a missed opportunity as the user could have been viewing another ad. Therefore, effective advertising relies on increasing the probability that a particular ad is placed in front of users who are more likely to purchase the product as a result of seeing the ad.

327. Without information regarding a user, content providers sold ads based on the content they were providing. For instance, *Bass Angler Magazine*, even if it did not have specific information regarding readers, could surmise that someone reading the magazine was interested in bass fishing. Therefore, they could market advertising space to those selling fishing equipment or locations with a credible claim that those advertisers would be more effective placing ads in the magazine than in some other, more general outlet. Because the 'hit rate' of such ads was higher, *Bass Angler Magazine* could potentially charge a higher price for those ads as readers self-selected based on their interests.

328. The Internet afforded a new opportunity to create better matches between advertisers and users. By installing software known as cookies, advertising platforms could observe the behavior of users online.[360] This would generate all manner of data from which to infer information regarding a user's characteristics that could, in turn, be used to make a prediction about the user's intent or attraction to certain products. For example, a user visiting an online fishing site could be inferred to be interested in fishing. If that user could be targeted as they visited other sites, they could be served up fishing ads even on sites that did not have fishing content. Thus, competition to run ads became available to a wider range of content providers. It is a hallmark of modern online advertising markets that advertisers, even when interested in particular users, can advertise widely, competing for places wherever user attention might be. Thus, while in the past advertisers might have been segmented, in online advertising, they engaged in a common path and through aggregated matching services to place ads in front of targeted users.

329. However, the usefulness of data that could be gathered through user online behavior was even richer than simple expressions of user interest. For instance, knowing where a user might reside can be difficult when advertising online. Thus, if you are in a business in a particular location or city, online

[360] Bergemann, Dirk, and Alessandro Bonatti. "Selling cookies." *American Economic Journal: Microeconomics.* 7, no. 3. 2015. 259-294.

advertising may result in poor match quality unless you know a user's location. However, user locations could be readily monitored using IP addresses and mobile phone locations (if a user permitted). By gathering this data and allowing advertisers to select to advertise only to users in specific locations, match quality would be increased.[361]

330. There are many other examples of content that can be used to associate purchase intent with particular users. In addition to location and user visits to specialized content sites, data targeting may enable user search behavior with regard to visiting retail and other service sites, including, in some cases, a record of actual purchases made. The latter could assist advertisers in not advertising to users who have recently purchased their own or a competitor's product, another example of potentially wasted ad impressions. All of this data, to the extent that it can be attached to a given user when they visit a website or use an application, can improve advertiser-user matches and, hence, the willingness to pay advertisers for ads with that quality.

331. While having a comprehensive portfolio on a user is desirable for securing high-quality matches, in many cases, such comprehensive data is not available. To close this gap, advertising platforms have become increasingly sophisticated in using statistical techniques utilizing machine learning – commonly known as artificial intelligence – to use data from large numbers of users to predict the purchase intent of any given user.[362] While these predictions are not perfect, from an advertiser's perspective, they are significantly more likely to identify a high-quality match than just using the directly associated data of a user alone.

1) Data as a non-rival good

332. It is useful to reflect on why data targeting can be so useful in businesses that are ad-funded. There was a time, now many decades ago, when very few regularly published content outlets were available to consumers. For example, there may have been one or two newspapers in a town and a few television news programs. In this situation, those outlets could offer advertisers a simple product: "advertise with us, and you will reach all of these consumers that are not available anywhere else." Thus, advertisers wanting to reach a large number of consumers could place ads on all outlets and be relatively assured that consumers who saw those ads had seen them a few times.

[361] Athey, Susan, and Joshua S. Gans. "The impact of targeting technology on advertising markets and media competition." *American Economic Review: Papers and Proceedings*. 100, no. 2. 2010. Pg. 608-613.
[362] For a discussion of these techniques, *see* Ajay Agrawal, Joshua Gans and Avi Goldfarb, *Prediction Machines: The Simple Economics of Artificial Intelligence*. 2nd Ed., Boston, Harvard Business Review Press, 2022.

333. The Internet changed this behavior. Most users these days visit dozens of sites regularly and obtain content from many content providers. Without knowing who those users are, no one outlet can offer products that give exclusive or near-exclusive access to the attention of users. Instead, an advertiser faces a dilemma. They can choose to advertise on many outlets but know that many ads will be wasted as consumers will see them many more times than is optimal. Or they can focus on some outlets but miss reaching many other consumers in the process. From the perspective of optimizing match quality, both of these options represent poor outcomes. They reduce the effectiveness of ad campaigns and the amount advertisers spend per ad.[363] This is a reason why online ads sell at a fraction of those offline.[364]

334. Data, however, is what economists term a 'non-rival' good. This means that if one firm or platform uses user data, another firm or platform can use the same data. By contrast, for rival goods, such as apples, if one person consumes an apple, it denies another from consuming that same apple. Non-rivalry, therefore, means that if there is use for data, it is socially desirable for that data to be made available as widely as possible.

335. Consider what this might mean for an idealized advertising market.[365] Suppose that all platforms could identify users with their relevant data characteristics and a history of ads that each user had already viewed in the recent past. Then, any advertiser who desired to match with a specific user could potentially purchase an impression of that user on any of the sites they visited. They would not have to worry about duplicate impressions, so there would be no inefficiency from unintended matches. Each website could then offer advertisers access to particular users with the highest match quality. Websites would then be incentivized to provide content that simply attracted the attention of more users so they could monetize that content with a greater share of total user attention. This would create maximal competition for user attention.

336. From an advertiser perspective, in the idealized market, advertisers should have many options for where to place advertisements for given users. This would also increase their competitive outcomes, at

[363] When users visit many content sites, this is called "multi-homing." It is the degree of multi-homing that drives the potential difficulty in achieving high match quality. *See* Athey, Susan, Emilio Calvano, and Joshua S. Gans. "The impact of consumer multi-homing on advertising markets and media competition." *Management Science.* 64, no. 4. 2018. Pg. 1574-1590; Anderson, Simon P., Øystein Foros, and Hans Jarle Kind. "Competition for advertisers and for viewers in media markets." *The Economic Journal.* 128, no. 608. 2018. Pg. 34-54; Anderson, Simon P., Øystein Foros, and Hans Jarle Kind. "The importance of consumer multihoming (joint purchases) for market performance: Mergers and entry in media markets." *Journal of Economics & Management Strategy.* 28, no. 1. 2019. Pg. 125-137; and Ambrus, Attila, Emilio Calvano, and Markus Reisinger. "Either or both competition: A "two-sided" theory of advertising with overlapping viewerships." *American Economic Journal: Microeconomics.* 8, no. 3. 2016. Pg. 189-222.
[364] Bergemann, Dirk, and Alessandro Bonatti. "Targeting in advertising markets: implications for offline versus online media." *RAND Journal of Economics*. 42, no. 3. 2011. Pg. 417-443.
[365] I described this idealized outcome first in my book, *Information Wants to be Shared,* Boston: Harvard Business Review Press, 2012.

least until all user attention is monetized. The end result is that ad revenue per user should be approximately equal across all platforms, ad exchanges, and content providers (publishers) in a specific advertising market.

337. This demonstrates why having data for the purpose of increasing the efficiency of user-advertiser matches generates competitive outcomes in both advertising and content markets, does not confer an advantage on any one advertising platform or network and generates efficient outcomes both in terms of the operation of the advertising market but also in consumer surplus generated.

2) The Value of Internal Tracking

338. This idealized outcome does not currently exist, even though much of the advertising industry's data collection and statistical effort is directed at improving the quality of user-advertiser matches. The reason is that important user identification and targeting data is not shared between platforms.

339. In order to avoid confusion, it is instructive to distinguish between the targeting of users with data and the tracking of users. Both are terms that arise in the economics literature on advertising. Targeting refers to using data to infer users' characteristics (and specifically, purchase intent). Tracking refers to the ability to monitor the behavior of an individual user with respect to ads that they have or have not viewed. As I will show, targeting and tracking are complementary uses of data that enhance a platform's ability to match advertisers with users more effectively. Potential entrants and incumbents, therefore, without data that allows them to target users, will face a disadvantage even if they can track users while on their platform.

340. Tracking data is more readily available within a platform or platform ecosystem. In that case, the platform can use that data to internally assist in solving the matching problem and increase the price of advertisements accordingly.

341. One incentive this can create is for platforms to try and capture a greater amount of user attention. In so doing, they can then sell that attention to advertisers with ad tech tools to optimize the matching of ads to users. If a platform were able to gain 100% of user attention, then it could replicate the idealized tracking described above. This, however, would potentially require a prohibitively costly amount of content creation.

342. Instead, there is a cheaper way in which to offer advertisers access to user attention alongside ad placement with higher match quality: invest in maximizing platform *reach*.[366] The idea here is that a platform wants to capture more and more users who, while they do not devote all of their attention to the platform, visit it regularly. Such reach is captured by metrics such as daily active users.

343. Importantly, a strategy of maximizing reach is (i) capable of replicating the data tracking potential of strategies that would require considerably greater attention acquisition, thereby achieving monopoly levels of advertising pricing; and (ii) this strategy is made more profitable the greater the challenges to achieving match quality elsewhere – including visits to a greater variety of sites outside of the platform.[367]

3) Data Confers Advantages in Advertising Markets

344. It is instructive to provide some intuition as to how a platform having exclusive access to user data that allows it to predict match quality and user purchase intent more precisely allows it to earn a premium for ads placed in an advertising market.

345. For any given user, assume they have a fixed amount of daily attention to devote to content. That content can have a limited number of ads (or, more precisely, ad impressions) associated with it. There are two types of advertisers. Some advertisers are willing to pay a high amount for matches with the right user, and others are willing to pay a lower amount for such matches. For each, matches with the wrong users are wasted impressions.

346. Suppose there are two platforms. Users, however, divide their attention between both platforms. Therefore, in principle, advertisers could place an ad on either platform and match it with any given user on that platform. As advertisers have two available options of where they can access a user, their willingness to pay for an ad impression on either one is what economists have termed *incremental*.[368] That is, advertisers know that if the price of an ad impression on one platform is too high, they have an option

[366] *See* Gans, Joshua. *Information Wants to be Shared,* Boston: Harvard Business Review Press, 2012;
Athey, Susan, Emilio Calvano, and Joshua S. Gans. "The impact of consumer multi-homing on advertising markets and media competition." Management Science. 64, no. 4. 2018. Pg. 1574-1590

[367] There is evidence that major ad platforms themselves actually facilitate users visiting a greater variety of sites and, in the process, according to the logic outlined above, this will increase their ability to charge a premium for their own ads. *See* Athey, Susan, Markus Mobius, and Jeno Pal. "The impact of aggregators on internet news consumption." Working Paper No. w28746. *National Bureau of Economic Research*. 2021.

[368] *See* Anderson, Simon P., Øystein Foros, and Hans Jarle Kind. "The importance of consumer multihoming (joint purchases) for market performance: Mergers and entry in media markets." *Journal of Economics & Management Strategy*. 28, no. 1. 2019. Pg. 125-137; Gentzkow, Matthew, Jesse M. Shapiro, Frank Yang, and Ali Yurukoglu. "Pricing power in advertising markets: Theory and evidence," Working Paper, No. w30278. *National Bureau of Economic Research*. 2022.

to advertise on the other and vice versa. Thus, the price advertisers pay for an ad is far below their willingness to pay to put an impression in front of any given user.[369]

347. Now, suppose that one platform has data that allows it to generate better matches than the other. To understand what happens in this situation, note that for advertisers who place a high value on being matched with the right user, their willingness to pay for ads on a platform that is more likely to provide good matches is much higher than their willingness to pay for ads on the other platform. Thus, those high-value advertisers will gravitate towards the data-rich platform, and that platform will not only be able to charge a higher premium to those advertisers but also a premium as those advertisers compete to have their ads placed in front of users on that platform. This means that data-rich platforms will be able to earn more per user in ad revenue than other platforms. In other words, even if users themselves switch between platforms for their content, by having better user data, the data-rich platforms can exploit their market power over that data to extract greater price premiums from advertisers.

C. Google's DFP has monopoly power in the market for publisher ad servers used for the sale of open web display advertising space

348. In this section, I present my analysis of the monopoly power of DFP, Google's publisher ad server in the market for publisher ad servers used for the sale of open web display advertising. I find that Google has monopoly power in the market for publisher ad servers used for the sale of open web display advertising space. Google's monopoly power is demonstrated through the following factors:

a. Google has a large and growing market share

b. High switching costs, which have led to publisher lock-in on the DFP ad server

c. High barriers to entry over time due to data advantages that deter new entry

d. There has been no recent history of entry

1) DFP's market share over time indicates that Google has monopoly power in the market for publisher ad servers used for the sale of open web display advertising

349. Google acquired DoubleClick, a publisher ad server, in 2008. Pre-acquisition, DoubleClick was the largest publisher ad server based on share of impressions served.[370]

---

[369] For empirical results related to this prediction, *see* Chandra, Ambarish, and Ulrich Kaiser. "Targeted advertising in magazine markets and the advent of the internet." *Management Science.* 60, no. 7. 2014. Pg. 1829-1843.

350. From 2008 through 2019, Google internally reported market share in the market for publisher ad servers based on the share of impressions, share of overall advertising spend, and share of publishers or addressable domains using DFP (Figure 9). These metrics may include transactions excluded from my market definition such as in-app ads and direct deals. These metrics are, however, still meaningful to assessing market power in the market for publisher ad servers used for the sale of open web display advertising as they reflect DFP's dominance over web publishers and in a broader market. Whenever possible, I discuss how the metrics presented provide a conservative estimate or a lower bound for DFP's market share in the relevant market focused only on web display ads.

351. I provide measures of Google's market share at various points in time. This information is based Google's internal documents.[371] I could not identify documents tracking Google's market share in the publisher ad server market after 2019 in Google's production consistently with Google policy since at least two years.[372] However, I have reviewed testimony from Google's corporate representative, [redacted], Managing Director of Global Publisher Platforms at Google, that: "All Google employees, specifically in the strategic realm, has been instructed -- just generic -- generic Google employees have been instructed not to do market share calculations. […] internal counsel has advised us, and as part of our PGTM [Product Go-To-Market] team, it is a general understanding within Google that we do not do market share analysis."[373] The metrics presented in Figure 9 below collectively indicate that Google has monopoly power.

[370] Evans, David S. "The Economics of the Online Advertising Industry." *Journal of Economic Perspectives*, vol. 23, no. 3, 2008, pg. 37. [redacted]

[371] I use data points from Google internal documents, except information on DoubleClick's market share pre-acquisition.

[372] Deposition of [redacted] (Managing Director for Global Publisher Platforms, Google), 259:16-259:25, May 1, 2024. ("Q. What else did you discuss with respect to the tracking of sell-side market shares? A. So we asked Susan a few questions in terms of her knowledge whether or not she knew before my time as to whether or not there were consistent tracking of sell-side market-shares. Susan confirmed that there was no consistent tracking of sell-side market shares that she knew of as well."); *See also,* Deposition of Darline Jean (Managing Director for Global Publisher Platforms, Google), 111:23-112:12, May 1, 2024. ("Q. How long has that been the case that Google employees have been instructed not to conduct market share calculations? A. It has been the case definitely since I joined the past two years. Before that, that's also, from my understanding, with my peers, that was also the understanding that market share cannot be part of our operations. Q. When was the first time that you received that instruction? A. The first time I received it was when I joined. As part of the GPL organization when I joined, it was very clear we cannot do market share analysis; and I was running the strategic team at that point in time.")

[373] Deposition of [redacted] (Managing Director for Global Publisher Platforms, Google), 110:24-111:12 and 111-122, May 1, 2024.

352. DFP's market share has been increasing since its acquisition by Google. [redacted].[374]

353. No matter how market shares are measured, Google's ad server consistently has monopoly power in the relevant market across the years. [redacted].[375] [redacted][376] [redacted].[377] [redacted][378] [redacted].[379] This shows clearly that Google had a consistently high share in the market for publisher ad servers used for the sale of open web display advertising.[380] Since, as I describe below, most publishers use a single ad server, these shares are good indicators of Google's monopoly power.

---

[374] This precedes programmatic buying of open web display advertising. For this reason, this number should only be used as suggestive evidence of DoubleClick's size relative to similar ad tech tools at the time. [redacted]. DoubleClick's 2006 share is calculated from the firm's total revenue. The revenue figures for DoubleClick and 24/7 RealMedia are for the respective companies' entire revenue, including but not necessarily restricted to revenue from the provision of software tools. *See*, David S. Evans. "The Economics of the Online Advertising Industry", May 2008, p. 37, [accessed February 27, 2024]. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1086473. I [redacted] While AdSense is not in the publisher ad server market, impressions served are counted across large publishers and small publishers that use a network like AdSense. *See* AdAge. "Google Leads in Ad-Serving Share" (December 18, 2008). Accessed on May 10, 2024. https://adage.com/article/digital/google-leads-ad-serving-share/133378

[375] GOOG-NE-01663183 at 34-35. "Americas Partnerships QBR – Q1 2011" (May 2011). Internal Google PowerPoint on Google's market position. The PowerPoint excludes text, mobile and video spend. [redacted])

[376] GOOG-NE-13279022 at -28. "DFP Fees on Google-monetized impressions" (June 4, 2012). Internal Google PowerPoint on DFP market. ("DFP Premium Platform Footprint" in US is ~85%.")

[377] GOOG-TEX-00089241 at -242. "Re: The REAL Header Bidding Threat …" (October 15, 2015). Internal Google email thread with [redacted], [redacted], [redacted], and [redacted]. Google email estimating 2015 market share for publishers. [redacted]

[378] [redacted] 00482536 at -549, 550. [redacted]

[379] GOOG-NE-03467508 at -540. "Business Forecast Meeting" (June 24, 2019). Internal Google presentation with appendix containing quarterly market shares and YoY growth. DFP connection included connection through DFP tags, AdSense, or Yavin. 2018 Q1 share is based on addressable domains running ads and estimated number of impressions; GOOG-NE-03467508 at -540. "Business Forecast Meeting Sell-Side" (June 24, 2019). Internal Google PowerPoint on sell-side performance with appendix containing YoY market shares. 2019 Q1 share is based on addressable domains running ads and estimated number of impressions.

[380] [redacted] This data point provides a helpful order of magnitude for the volume of display web inventory flowing through GAM in 2020. I note however that this is not directly comparable to the previous metrics on DFP market shares as it accounts for AdX as well as DFP. See GOOG-TEX-00438280 at -285. "Display Business Overview" (November 2020). Google presentation on its display business.

Figure 9

[redacted]

[381] This figure shows the share of DFP in the publisher ad server market in the US over time. The shares are in different metrics because of the limited data. The vertical lines indicate the timing of the acquisition of DFP by Google and the timing when Google implemented contractual tie. The legend shows the metric of the share for each bar. DoubleClick's 2006 share is calculated from firms' total revenue. Note that the revenue figures for DoubleClick and 24/7 RealMedia are for the respective companies' entire revenue, including but not necessarily restricted to revenue from the provision of software tools. *See*, David S. Evans. "The Economics of the Online Advertising Industry", May 2008, p. 37, [accessed February 27, 2024]. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1086473. [redacted] "Google Leads in Ad-Serving Share" (December 18, 2008). Accessed on May 10, 2024. https://adage.com/article/digital/google-leads-ad-serving-share/133378. For 2010-2011 shares see: GOOG-NE-01663183 pages 34-35; Excludes text, mobile and video spend. Net revenue is revenue after any rev share such as Traffic Acquisition Cost. [redacted] For 2012 share see: GOOG-NE-13279022 page 7. [redacted] is reported in GOOG-TEX-00089241 at -242. "Re: The REAL Header Bidding Threat…" (October 15, 2015). Internal email thread with [redacted] and [redacted]. Google email estimating market share for publishers. 2018 Q1 share is based on addressable domains running ads and estimated number of impressions as reported in GOOG-NE-03467508 at -540. "Business Forecast Meeting Sell-Side" (June 24, 2019). Internal Google PowerPoint on sell-side performance with appendix containing YoY market shares. DFP connection included connection through DFP tags, AdSense, or Yavin. I define DFP tags and Yavin later in the report. 2019 share is based on addressable domains running as reported in GOOG-NE-03467508 at -540. "Business Forecast Meeting Sell-Side" (June 24, 2019). Internal Google PowerPoint on sell-side performance with appendix containing YoY market shares. This figure shows the share of DFP in the market for publisher ad servers used for the sale of open web display advertising in the US over time. The shading area indicates the time before the acquisition of DFP by Google. The legend shows the metric of the share for each bar.

354. I understand Google stopped tracking market shares in the recent years (Paragraph <345>). [redacted]. This is because there has not been any additional entry, switching costs to other competitors remain high, and other competitor market shares appear to have remained de minimis.

355. Moreover, Google competitors are small. In 2014, Brian Lesser, CEO of Xandr, noted that Xandr's ad server was "a very distant No. 2" behind DFP.[382] [redacted].[383] [redacted]

356. Competitors acknowledge Google's dominance in this market. In his 2023 deposition, [redacted][384] [redacted][385] [redacted][386,387]

[382] AdExchanger. "WPP Group Supplies AppNexus With Open AdStream And A $25M Check" (September 22, 2014). Accessed on May 10, 2024. https://www.adexchanger.com/platforms/wpp-group-supplies-appnexus-with-open-adstream-and-a-25m-check/

[383] Deposition of [redacted] *See also*, Deposition of [redacted] *See also* Deposition of [redacted]

[384] Deposition of [redacted]

[385] Deposition of [redacted]

[386] Deposition of [redacted]

[387] *See also* Deposition of [redacted] *See also* Deposition of [redacted]

2) Publishers face high ad server switching costs

357. Publishers face high switching costs to change ad servers.[388] As Google's Head of Mobile Platform Sales stated in an internal email, "Ad Servers are sticky, and hard to replace", meaning that there is an opportunity to "lock in" publishers.[389] Likewise, [redacted][390] Notably, [redacted].[391]

358. To switch ad servers, publishers need to migrate rules, tags, and properties for their web pages from the old ad server to the new ad server.[392] These activities are expensive and time consuming. The Global Head of Sales of Facebook's ad server, Atlas, explained: "the process of 'onboarding' a new ad server is a difficult one, with the initiation of new system, which involves adding new tagging, among many other chores, widely deemed a laborious one."[393] [redacted]. Additionally, [redacted][394]

[redacted]

388 Google's Dynamic Allocation program further increased publisher switching costs. I analyze Dynamic Allocation in Section VII.B.

389 GOOG-AT-MDL-012473362 at -362. "AdX Mobile Stand Alone" (September 10, 2012). Internal Google email thread with [redacted], [redacted], [redacted], [redacted], and [redacted].

390 Deposition of [redacted]

391 Deposition of [redacted]

392 VideoWeek. "Why Don't More Publishers Switch Ad Servers?" (June 6, 2019). Accessed on May 10, 2024. https://videoweek.com/2019/06/06/why-dont-more-publishers-switch-ad-servers/; For example, Nigel Gilbert, Chief Market Strategist at AppNexus, explains the complexity of this task: "If you consider all of the rules, properties, pricing and tags that have been put on the publisher's web pages, and the inventory on all of those pages, which can be hundreds of thousands or hundreds of millions of pages, then you start to see that actually you've got a very very complex set of rules that goes very deep. It's all the way through your website and all the way through your inventory. And what we're saying is rip all of that out and start again."

393 The Drum. "The ad server world is pretty commoditized – Why Facebook closed its ad server" (November 8, 2016). Accessed on May 10, 2024. https://www.thedrum.com/news/2016/11/18/the-ad-server-world-pretty-commoditized-why-facebook-closed-its-ad-server

394 Deposition of [redacted]

359. In addition, [redacted][395] [redacted].[396]

360. Publishers need to invest significant time and financial resources to train their workforce to use a new ad-serving tool, or else hire new labor. Today, Google's dominance in the market for publisher ad servers used for the sale of open web display advertising means a large part of the workforce is only familiar with Google's ad tech tools. Nigel Gilbert, Chief Market Strategist at AppNexus, explained: "Because DFP has been so entrenched, let's say for coming on to twenty years now, you'll find that for a

[redacted]

[395] Deposition of [redacted]

[396] Deposition of [redacted]

lot of campaign management or ad ops teams, it's actually all they know."[397] For instance, British Gas faced challenges in retraining its workforce when it migrated from Google to Flashtalking.[398] Nigel Gilbert, Chief Market Strategist at AppNexus, explained: "If you're going to move ad servers, you're going to need people to be dedicated to that project, and naturally most companies don't have spare capacity in their workforce."[399] Many publishers do not have the capacity to invest in this costly process.

361. [redacted][400] and that [redacted][401,402] Google acknowledged that publishers "continue to rely on the Google-controlled intermediation chain for must-have demand from advertisers."[403]

362. The CMA also noted that "some publishers told us that the main cost of switching to a non-Google ad server is the risk of losing access to Google's DSPs (particularly Google Ads), which they consider a very important source of demand."[404]

---

[397] VideoWeek. "Why Don't More Publishers Switch Ad Servers?" (June 6, 2019). Accessed on May 10, 2024. https://videoweek.com/2019/06/06/why-dont-more-publishers-switch-ad-servers/
[398] AdExchanger. "Why British Gas Ditched Google's Ad Server" (January 31, 2019). Accessed on May 10, 2024. https://www.adexchanger.com/online-advertising/why-british-gas-ditched-googles-ad-server/
[399] VideoWeek. "Why Don't More Publishers Switch Ad Servers?" (?" (June 6, 2019). Accessed February 1on May 10, 2024. https://videoweek.com/2019/06/06/why-dont-more-publishers-switch-ad-servers/
[400] Deposition of [redacted]
[401] Deposition of [redacted]
[402] Similarly, in his deposition Arna[redacted] *See* Deposition of [redacted]
[403] GOOG-DOJ-19333069, at -079. "Roadmap for a Digital Advertising Monopolization Case Against Google" (May 2020).
[404] Competition and Markets Authority. "Online platforms and digital advertising: Market study final report - Appendix M: intermediation in open web display advertising" para. 385 (July 1, 2020). https://assets.publishing.service.gov.uk/media/5fe495c28fa8f56afaf406d4/Appendix_M_-_intermediation_in_open_display_advertising_WEB.pdf

3) Google's data advantage is a barrier to entry

363. DFP collects a large volume of user and transaction data giving. This data gives DFP a competitive advantage over any potential new entrants.[405] Publisher ad servers need to acquire data to facilitate the ad selection process and enable publishers to manage and control their inventory.[406]

364. The scale of data required for effective operation in the market for publisher ad servers used for the sale of open web display advertising acts as a significant deterrent to new entrants. Google's large market share of publisher ad servers means that it has access to a vast network of websites.[407] Google can collect a large volume of data about users through this network. As [redacted][408] An industry guide notes that "The consolidation of cookie information results in an extremely rich pool of data for Google advertisers, as they can keep track of what ads you [users] are served across millions of different websites."[409] [redacted][410] This is one dimension of the difficulty an entrant faces to achieve viable scale.

[405] Deposition of [redacted]

[406] A publisher ad server relies on transactions and user data to attract customers. Transaction data can pertain to the actions of both publishers (e.g., price floor settings) and advertisers (e.g., bids for impressions). Ad servers provide publishers with information on their ad inventories, CPM rates for line items, and price floors. Ad-buying tools submit bids on different ads to ad servers on behalf of advertisers.

[407] GOOG-NE-03467508 at -540. "Business Forecast Meeting (Sell-Side)" (June 24, 2019). Internal Google presentation with appendix containing quarterly market shares and YoY growth.

[408] Deposition of [redacted]

[409] HubSpot. "Ad Tracking: What It Is & How to Do It" (March 10, 2022). Accessed on January 29, 2024. https://blog.hubspot.com/blog/tabid/6307/bid/7249/a-marketer-s-guide-to-tracking-online-campaigns.aspx

[410] Deposition of [redacted]

365. Google's dominance also means that Google can collect a vast amount of data in a limited timeframe.[411]

366. I discuss below how Google's tying conduct further raises artificial barriers to entry in the market for publisher ad servers used for the sale of open web display advertising by allowing DFP to leverage from AdX's scale in the market for ad exchanges for transacting indirect open web display advertising. For example, in 2015, Google launched Reserve Price Optimization (RPO).[412] With RPO, Google's ad server was able to predict bidders' willingness-to-pay and dynamically adjust reserve prices by training its RPO model on AdX data.[413] DFP's data advantage allows it to implement algorithms that competitors cannot offer due to insufficient scale. RPO is also an example of how Google's algorithmic manipulation of auction inputs makes Google's take rate from publishers and pricing rules, more generally, less transparent to publishers.

4) The history of entry and exits is consistent with high barriers to entry

367. Since 2007, many new entrants in this market have failed or have been acquired. Table 4 below provides a timeline of entry and exits in the market. As shown in the graph, the most recent market entrant was in 2015. This lack of entry is an indicator of high barriers to entry.

Table 4

Timeline of entry and exits in the market for publisher ad servers used for the sale of open web display advertising

Ad Server (Company)	Entry	Exit
aQuantive (Microsoft)	2007	2012[414]
OpenRamp (OpenX)	1998[415]	2013[416]

[411] In his deposition, [redacted] Deposition of [redacted]
[412] GOOG-DOJ-15776523 and Google's First Am. Resps. and Objs. to Plaintiff's Third Set of Interrogs. (May 24, 2024) at 12.
[413] GOOG-NE-13204729 at -734. "AdX Dynamic Price" (August 17, 2015). Internal Google PowerPoint on RPO. (Slide explaining methodology on "How to Guess the Top Bid")
[414] CNN Money. "Microsoft's $6 billion whoopsie" (July 12, 2012). Accessed on May 10, 2024. https://money.cnn.com/2012/07/02/technology/microsoft-aquantive/index.htm
[415] AdButler. "Ad Networks vs Ad Exchanges: The History of Programmatic Advertising" (March 15, 2021). Accessed on May 2, 2024. https://www.adbutler.com/blog/article/ad-networks-vs-ad-exchanges-the-history-of-programmatic-advertising. ("OpenX began development as an open source ad server project in 1998")
[416] AdExchanger. "OpenX Confirms 'Lights Out' For OnRamp Ad Server" (February 12, 2013). Accessed on May 10, 2024. https://www.adexchanger.com/online-advertising/openx-confirms-lights-out-for-onramp-ad-server/

Ad Server (Company)	Entry	Exit
Atlas (Facebook)	2013[417]	2016[418]
ValueClick/Conversant (Alliance Data)	--	2019[419]
Yahoo! Publisher Network/ AOL/AdTech/Oath (Verizon)	2015[420]	2020[421]

368. Market exit also shows that entrants face substantial barriers. Industry participants have stated market exit is linked to Google's market power in the market for publisher ad servers used for the sale of open web display advertising. An industry participant claimed: "Google thus destroyed what was once (in the early 2010s) a diverse and crowded ad tech industry."[422] For instance, a 2016 article about Facebook shutting down its ad server Atlas stated: "Could Facebook put together a scaled, mature ad tech stack that would act as a check on Google's power? Turns out it couldn't."[423]

369. One academic paper summarized: "On the ad server side at the time of Google's purchase of DoubleClick, there were multiple viable alternatives (OAS, AdTech, Atlas). Ten years later only AppNexus remained, which was then bought by AT&T. These businesses have lost all or part of their revenue due to the anticompetitive conduct of Google which constitutes part of the antitrust harm."[424]

[417] Facebook acquired Atlas from Microsoft in 2013. *See* Gigaom. "Facebook purchases Microsoft's Atlas Solutions for reported $100 million" (February 28, 2013). Accessed on May 10, 2024.
[418] AdExchanger. "Facebook Shutters Atlas Ad Server, Ending Its Assault On DoubleClick; Atlas To Live On As Measurement Pixel" (November 18, 2016). Accessed on May 10, 2024. https://www.adexchanger.com/platforms/facebook-shutters-atlas-ad-server-ending-assault-doubleclick-atlas-live-measurement-pixel/
[419] AdButler. "AdButler is your best Conversant alternative" (undated). Accessed on May 10, 2024. https://www.adbutler.com/conversant-alternative/
[420] Oath was a combination of technological assets including AOL, acquired in 2015, and Yahoo, acquired in 2017. See Business Insider. "Verizon will write down $4.6 billion in value of Oath, the unit that combined AOL and Yahoo assets" (December 11, 2018). Accessed on May 10, 2024. https://www.businessinsider.com/verizon-will-write-down-46-billion-in-value-of-oath-2018-12
[421] AdExchanger. "Verizon Media Shuts Down Its Ad Server; Legacy Brands Stave Off the DTCs" (March 6, 2019). Accessed on May 2, 2024. https://www.adexchanger.com/ad-exchange-news/wednesday-03062019/#:~:text=Verizon%2520Media%2520will%2520shutter%2520the,of%2520its%2520mobile%2520app%2520SDK
[422] Kevel. "OpenX Ad Server Alternatives" (December 19, 2018). Accessed on June 3, 2024. https://www.kevel.com/blog/openx-ad-server-alternatives
[423] AdExchanger. "Facebook Shutters Atlas Ad Server, Ending Its Assault On DoubleClick; Atlas To Live On As Measurement Pixel" (November 18, 2016). Accessed on May 10, 2024. https://www.adexchanger.com/platforms/facebook-shutters-atlas-ad-server-ending-assault-doubleclick-atlas-live-measurement-pixel/
[424] Scott-Morton, F. and Dinielli, D., "Roadmap for a Digital Advertising Monopolization Case Against Google" (May 2020). Accessed February 1, 2024. https://omidyar.com/wp-content/uploads/2020/09/Roadmap-for-a-Case-Against-Google.pdf

D. AdX has monopoly power in the market for ad exchanges for transacting indirect open web display advertising

370. In this section, I evaluate Google's monopoly power in the market for ad exchanges for transacting indirect open web display advertising ("ad exchange market").[425] I find that Google has market power in this market. Google's market power is evident because of the following factors:

a. Dominant and growing market share over time

b. High barriers to entry due to indirect network effects

c. There has been no recent history of entry

371. My analysis of each of these factors is provided in the following sections.

1) AdX's market share over time indicates that Google has monopoly power in the market for ad exchanges for transacting indirect open web display advertising

372. While Google directs employees to refrain from performing market share calculations,[426] Google has internally reported market share in the market for ad exchanges based on the share of impressions and gross spend. I could not identify recent documents tracking Google's market share in the ad exchange market in Google's production.[427] Below, I report my estimates of AdX's market share based on an approximation of the relevant set of open web display impressions transacted using DFP indirect transactions.

[425] "Ad exchange" and "SSPs" are often used interchangeably. In this section, I use quotes that often designate exchanges as "SSPs."

[426] Deposition of [redacted] (Managing Director for Global Publisher Platforms, Google), 113:12-113:23, May 1, 2024. ("Q. Is there a policy with respect to this directive that no Google employees conduct market share calculations? […] THE WITNESS: Ms. Young, that's the policy since I've joined. Whether or not it's a written policy, I'm not a hundred percent sure; but that's the mindset. Market share is not something we do as part of our operates -- day-to-day operations.")

[427] Deposition of [redacted] (Managing Director for Global Publisher Platforms, Google), 259:16-259:25, May 1, 2024. ("Q. What else did you discuss with respect to the tracking of sell-side market shares? A. So we asked [redacted] a few questions in terms of her knowledge whether or not she knew before my time as to whether or not there were consistent tracking of sell-side market-shares. [redacted] confirmed that there was no consistent tracking of sell-side market shares that she knew of as well."); *See also,* Deposition of [redacted] (Managing Director for Global Publisher Platforms, Google), 111:23-112:12, May 1, 2024. ("Q. How long has that been the case that Google employees have been instructed not to conduct market share calculations? A. It has been the case definitely since I joined the past two years. Before that, that's also, from my understanding, with my peers, that was also the understanding that market share cannot be part of our operations. Q. When was the first time that you received that instruction? A. The first time I received it was when I joined. As part of the GPL organization when I joined, it was very clear we cannot do market share analysis; and I was running the strategic team at that point in time.")

Table 5

[redacted]

373. Data from Google's ad server shows that AdX had a significant and growing share of the display ad impressions transacted indirectly (i.e., via ad exchanges, ad networks and Header Bidding) between 2018 and 2021 in North America.[429] [redacted].[430]

374. These market shares are in accord with the views of industry participants. According to [redacted]

---

[428] [redacted]

[429] The Header Bidding Monitor data used here is only available for North America without country breakdowns preventing a US-specific analysis. I have also estimate AdX's market share using RFP 51-52 for 2022 and find similar estimates.

[430] In 2019, DFP served [redacted] of addressable impressions (see Section V.C.1). Header Bidding Monitor data captures impressions transacted by DFP in North America. I separately use impressions from the Header Bidding Monitor data to bound the effect of the remainder [redacted] of the market to be addressed by third-party ad servers. I use the AdX submission data for the US to estimate that AdX direct in the US represented [redacted] of impressions served by third-party ad servers in North America in 2019. Therefore, AdX's share of DFP impressions is representative of AdX's share of overall display impressions in the US in 2019.

[redacted][431] [redacted][432] [redacted].[433,434] Google noted that it had [redacted] of indirectly sold gross revenue in the U.S. exchange market in 2011.[435] Industry participants also believe that AdX has remained dominant in recent years.[436]

375. Internal Google documentation shows that AdX had a growing share of global indirect impressions between 2016 and 2017.[437] For the Americas region specifically, Google notes that AdX's

[431] Deposition of [redacted]

[432] Deposition of [redacted]

[433] Deposition of [redacted]

[434] Similarly, in his deposition, [redacted]

[435] GOOG-NE-00133272 at -300. "Media and Platform Metrics: Monetization discussion." (May 24, 2011). A total of [redacted] of the "exchange layer" market is classified as indirect by Google (GOOG-TEX-00971726 at -736), with AdX controlling [redacted], "Other Exchange" controlling another [redacted], and "Network Transaction" comprising the remaining [redacted]. [redacted] of [redacted] is [redacted], therefore AdX controls [redacted] of the market share. Gross revenue metric interpreted from -299 and -298.

[436] In his 2023 deposition, [redacted] Deposition of [redacted]

[437] GOOG-TEX-00971726 at -736. "Header Bidding Observatory #2" (May 2017). Internal Google presentation detailing Header Bidding adoption.

share of indirect impressions grew from [redacted] to [redacted] from Jan 2016 to Feb 2017.[438] AdX's market share of indirect impressions presents a broader view of the relevant market and thus indicates the lower-end of AdX's market share in the market for ad exchanges for transacting indirect open web display advertising .

376. AdX is almost [redacted] as the next closest rival, Xandr. In 2018, Google's exchange transacted at least [redacted] in gross revenue.[439] Rival exchanges like Xandr transacted less than $2 billion,[440] Rubicon and [redacted] each transacted less than $1 billion,[441] [redacted][442] and [redacted][443] transacted close to [redacted] each. This difference reflects the fragmentation of the non-Google share of the market.[444]

2) The ad exchange market has high entry barriers due to indirect network effects

377. A barrier to entry exists if an entrant faces higher costs of competing for customers than incumbent providers. Indirect network effects create such entry costs. In this case, it is difficult given Google's market power in adjacent markets for an entrant to gather enough buyers and sellers to obtain sufficient scale. For an individual exchange, indirect network effects emerge when the value buyers is increasing in the number and activity of sellers and vice versa.[445]

[438] GOOG-TEX-00971726 at -736. "Header Bidding Observatory #2" (May 2017). Internal Google presentation detailing Header Bidding adoption. Indirect impressions are defined at -769 as impressions coming from "Network + Bulk + Price Priority + AdX.".

[439] GOOG-NE-06808544. (undated). Tab "Served Rev." Internal Google spreadsheet of ads revenues. The total revenue for Ad Exchange in the fiscal year 2018 is [redacted] ("Cell AP23"). The geography for this data point is not specified.

[440] AT&T. "2020 Annual Report" (2020). p. 28. Accessed on May 10, 2024. https://investors.att.com/~/media/Files/A/ATT-IR-V2/financial-reports/annual-reports/2020/complete-2020-annual-report.pdf. The table titled "Total Advertising Revenues" on page 28 indicates that the total worldwide advertising revenues for Xandr in 2018 was $1.74 billion. This operating revenue likely includes all of Xandr ad tech products, including its ad exchange and DSP.

[441] Rubicon. (2018). Form 10-K 2018. p. 62. https://investor.rubiconproject.com/static-files/8a580113-34ad-4938-8085-c0fba5d365c5. The table in the "Advertising Spend" section page 62 shows that Advertising Spend [worldwide] for the Year Ended December 31, 2018 is $992 million. [redacted] 00000031. (undated). [redacted]

[442] [redacted] 00000001. (undated). [redacted].

[443] [redacted] DOJ-00003611. (undated). [redacted]

[444] In his deposition, [redacted] Deposition of [redacted]

[445] *See* Jullien, Bruno, Pavan, Alessandro, & Rysman, Marc. "Chapter 7 – Two-sided markets, pricing, and network effects." *Handbook of Industrial Organization*, 2021. ("Indirect network effects emerge when the adoption and use of a product leads to increased provision of complementary products and services, with the value of adopting the original product increasing with the provision of such complementary goods.") and Jullien, Bruno, & Sand-Zantman, Wilfried. "The Economics of Platforms: A Theory Guide for Competition Policy." *Information Economics and Policy*, vol. 54, 2021. ("Potential users of a platform are

378. My argument is as follows:

a. The majority of publishers and small advertisers use sell-side and buy-side tools provided by Google, which directs a disproportionate amount of traffic to AdX. Exchanges connect to publisher ad servers and ad-buying tools. Publishers offer their ad inventory for sale via ad servers, and advertisers bid on the inventory via ad-buying tools.

b. Because the volume of activity on AdX is relatively higher, publishers and advertisers find it advantageous to choose to accept or make bids on AdX for advertising transactions.

c. Rival and entrant exchanges to AdX face a coordination problem in that they need to attract both publisher and advertiser bids in order to provide a market with the thickness that characterizes AdX. Rival exchanges face a "chicken and egg" problem. This outcome implies that non-AdX exchanges face higher barriers to entry and expansion.

379. In what follows, the basis for each of these steps in the argument is presented.

380. In Section VII, I present evidence that Google has used its monopoly power in the publisher ad server market to steer demand towards AdX that creates a barrier to entry. In Section VI, I discuss how Google's tying conduct further raises artificial barriers to entry reinforcing network effects in favor of Google's products in the market for ad exchanges.

381. Separately, data advantages create barriers to entry. Advertisers can benefit from more publishers joining an individual ad exchange. Advertisers purchase inventory primarily based on demographics, page content (e.g. premium, news, sports), and interest category (e.g. sports, entertainment, technology). An exchange with an extensive network of publishers that do not transaction proportionately elsewhere offers advertisers access to a broader spectrum of target audiences and content categories. Advertisers can then tap into this more diverse set of demographics, interests, and geographic locations, thereby optimizing their campaigns for relevance and engagement. So, as more publishers offer their inventory on the same ad exchange, more varied audiences associated with the different websites become available for advertisers to reach.

382. Similarly, publishers benefit from more advertisers available in an ad exchange as it results in higher and more varied demand for their inventory. The increased demand results in more competitive

---

often concerned about the size of the other side's population to which they will be matched. A seller is more likely to visit a platform if there are many potential buyers, and vice-versa.")

pressure for the publisher's inventory being offered, resulting in higher yields and higher-quality ads being shown on the publisher's page. Consequently, the exchange becomes more attractive to publishers as they gain enhanced value and revenue opportunities for their ad inventory.

383. Thus, as more participants join each side of the market for ad exchanges for transacting indirect open web display advertising, the value of an ad exchange grows for both publishers and advertisers, creating indirect network effects.[446] This can raise the level minimum efficient scale at which new entrants can achieve post-entry profit. In order to operate efficiently, a new entrant must have sufficient advertiser demand to attract publishers, and sufficient publisher inventory to attract advertisers.

384. Internally, Google recognized the influence of indirect network effects on the market for ad exchanges for transacting indirect open web display advertising . Google described these effects as "a virtuous circle"[447] and stated that "more pubs from DFP means more attractive to advertisers… more advertisers mean more desire for pubs to get on DFP." Google believed that "without AdX, [Google] wouldn't have the network effect."[448]

385. The effect of these indirect network effects favoring AdX were well-understood in the industry.[449] According to [redacted]

---

[446] *See* Jullien, Bruno, Pavan, Alessandro, & Rysman, Marc. "Chapter 7 – Two-sided markets, pricing, and network effects." *Handbook of Industrial Organization*, 2021. ("Indirect network effects emerge when the adoption and use of a product leads to increased provision of complementary products and services, with the value of adopting the original product increasing with the provision of such complementary goods.") and Jullien, Bruno, & Sand-Zantman, Wilfried. "The Economics of Platforms: A Theory Guide for Competition Policy." *Information Economics and Policy*, vol. 54, 2021. ("Potential users of a platform are often concerned about the size of the other side's population to which they will be matched. A seller is more likely to visit a platform if there are many potential buyers, and vice-versa.")

[447] GOOG-NE-04412452 at -490. "A Romance…Lexi @P2 Offsite" deck on inventory strategy" (November 2013). Internal Google presentation explaining the products and platforms.

[448] GOOG-NE-04412452 at -489. "A Romance…Lexi @P2 Offsite" deck on inventory strategy" (November 2013). Internal Google presentation explaining the products and platforms. ("By the way, the thing that connects these two is our Exchange - AdX - without AdX, wouldn't have the network effect") Google also recognized the strong network effects due to "reach" ("adding a publisher to the network adds a lot of value for advertisers") and "auction pressure" ("adding an advertiser to the network adds a lot of value for pub[lisher]s"). *See* GOOG-DOJ-14954902 at -915. Google internal presentation titled "GDN Inventory Strategy" (undated)." (June 23, 2014). Internal Google presentation on how to deal with disintermediation and disallow backfill.

[449] See also See e.g., Deposition of [redacted]

[redacted].”[450]

386. Additionally, [redacted]”[451]

387. The more participants join each side of the ad exchange, the easier it becomes to match impressions and ads. This phenomenon is known as "market thickness"[452] An established exchange's ability to produce incremental matches as new participants join increases while its marginal cost to perform matches remains the same. As a result, ad exchanges present economies of scale from the number of participants.

388. An industry guide from 2021 describes AdX as "the world's largest ad exchange" and mentions that "Google Display Network lets publishers sell their inventory at premium prices as Google AdX has some of the highest CPM in the industry. At the same time, advertisers can use it to serve various types of ads to billions of people worldwide. Google AdX clients even enjoy some of the best audience targeting options in the advertising industry."

389. Higher match rates, broader reach, and high-paying ads make an established ad exchange more attractive to both types of participants, reinforcing the network effects. A new exchange without a large customer base on each side of the market would need time and investment to accumulate a high enough

[450] Deposition of [redacted]

[451] Deposition of [redacted]

[452] *See* Halaburda, Hanna, Piskorski, Mikolaj Jan, & Yildirim, Pinar. "Competing by restricting choice: The case of matching platforms." Management Science, vol. 64, no. 8, 2018, pg. 3574-3594.

customer base to compete. For this reason, network effects in the market for ad exchanges for transacting indirect open web display advertising create barriers for new entrants.

3) The history of entry and exit in this market is consistent with high barriers to entry

390. Table 6 below provides a timeline of entry and exits in the relevant market. As shown in the graph, the most recent market entrant was in 2012.

Table 6

Timeline of entry and exits in the market for ad exchanges for transacting indirect open web display advertising

Ad Exchange (Company)	Entry	Exit
Right Media Exchange (Yahoo)	2005	2014[453]
AdECN (Microsoft)	2005	2011[454]
Pubmatic	2006	-
ADSDAQ / ContextWeb /Pulsepoint	2007	2021[455]
AdBrite	2008	2013[456]
OpenX	2009	-
Google AdX	2009	-
Magnite (formerly Rubicon and Teleria)	2009	-
Xandr/AppNexus (owned by Microsoft)	2010	-
FBX by Facebook	2012	2016[457]
Index Exchange	2012	-

[453] Business Insider. "Yahoo Has Officially Shut Down The Right Media Ad Exchange" (January 12, 2015). Accessed on June 5, 2024. https://www.businessinsider.com/yahoo-shuts-down-right-media-exchange-2015-1
[454] ZD Net. "Microsoft shuts down its ad-exchange acquisition" (February 1, 2011). Accessed on June 6, 2024. https://www.zdnet.com/finance/microsoft-shuts-down-its-ad-exchange-acquisition/
[455] AdExchanger. "WebMD Parent Company Internet Brands to Acquire PulsePoint" (April 29, 2021). Accessed on June 5, 2024. https://www.adexchanger.com/platforms/webmd-parent-company-internet-brands-to-acquire-pulsepoint/. In 2021, Internet Brands acquired Pulsepoint. Internet Brands turned Pulsepoint into a platform focused on programmatic transactions for healthcare marketers.
[456] AdExchanger. "AdBrite Shutters Exchange, Sale Talks Continue for Marketplace And IP Assets" (January 28, 2013). Accessed on June 6, 2024. https://www.adexchanger.com/platforms/adbrite-shutters-exchange-sale-talks-continue-for-marketplace-and-ip-assets/
[457] AdExchanger. "RIP FBX: Facebook Will Shut Down Its Desktop Retargeter In November" (May 25, 2016). Accessed on June 6, 2024. https://www.adexchanger.com/online-advertising/rip-fbx-facebook-will-shut-desktop-retargeter-november/

391. As shown in table 6, there has been no new entry in the last twelve years. This lack of entry indicates that there are substantial barriers faced by new entrants.

E. Google Ads has monopoly power in the market for ad-buying tools for small advertisers for buying open web display advertising space

392. In this section, I evaluate Google's monopoly power in the market for ad-buying tools for small advertisers for buying open web display advertising space. I find that Google has monopoly power in this market. Google's monopoly power is demonstrated through the following factors:

a. Dominant market share over time

b. High switching costs for advertisers, who typically use only one tool

c. High barriers to entry arising from advertiser single-homing and scale in data

393. My analysis of each of these factors is provided in the following sections.

1) Google Ads has a large market share over time

394. Google-produced data provides the annual total number of impressions in AdX won by Google Ads and other ad buying tools. In Figure 10, I present a lower bound for Google Ads' market share of impressions based on its share of AdX impressions transacted by ad buying tools for small advertisers (labeled Lower Bound). The lower bound on Google Ads' market share in the relevant market the very conservative that: (i) Google Ads' share of impressions transacted by ad buying tools for small advertisers indirectly via non-Google ad exchanges is 0% and (ii) that AdX's overall market share in the ad exchange market is consistent with AdX's share of impressions purchased by ad buying tools for small advertisers via ad exchanges. The figure also shows how Google Ads' share of impressions changes if we relax the second assumption (Conservative Estimate), making it more consistence with the evidence, in a way that remains conservative.

Figure 10

[redacted]

[458] At the lower bound, the Google Ads market share is estimated as the product of AdX market share and Google Ads' market share among all ad buying tools for small advertisers in AdX. I do the calculation in two steps. First, AdX market share of indirect impressions calculated in Table 5 is used to approximate AdX's share in the ad exchange market for transacting indirect open web display advertising. Second, the RFP 53 AdX submission data is used to calculate the share of AdX impressions purchased by Google Ads among all ad buying tools for small advertisers in AdX. The column "transaction" is restricted to "OA – Open Auction" and "user device" does not include "MobileApp" or "TabletApp." The calculation includes all ad buying tools with positive impressions in the US ("imps_usa > 0") or positive gross revenue in the US ("gross_rev_usd_usa > 0"). The outcome is calculated from "imps_usa" aggregated at the annual level. All ad buying tools are ranked by their impressions in each year and the top-20 tools are selected. Ad buying tools are classified as DSPs or ad buying tools for small advertisers using public information on their offerings. There are more than 600 ad buying tools that won impressions in AdX from 2014 to 2023. As an approximation, only data from the top-20 ad buying tools in each year (representing over 98% of the ad impressions in AdX between 2018 and 2021) is used. Among the top-20 ad buying tools, DSPs or tools operating outside of the US are disregarded. For this figure, ad buying tools for small advertisers include Google Ads, Marketgid, TellApart, Netmining, ShareThis, Infectious Media IDB, Criteo (JP), Criteo (US), Yahoo - RMX - NA, Yahoo - Display & App (EB), and AppNexus. Criteo (JP) is included because it contains a large fraction of ad impressions in the US. Non-Google exchanges have a much higher proportion of impressions transacted by large advertisers compared to AdX where Google Ads represented. So, even assuming AdX's share of impressions indirectly transacted by ad buying tools for small advertisers via ad exchanges is [redacted] is conservative. See Deposition of [redacted] In this scenario, I still assume Google Ads transacts 0% of impressions on third-party exchanges even though Google Ads transacted approximately [redacted] in the U.S. in 2018 via third-party exchanges (Data Sourced from RFP-20 dataset. Filters: Data filtered to contain only Google Ads product information; data aggregated by year and "ad_spend_third_party_exchange").

Table 7

[redacted]

395. Overall Google buying tools' share of AdX impression surpass [redacted] consistently between 2014 and 2021. And, in 2014, following the launch of Project Bernanke, Google Ads transacted [redacted] of AdX impressions via open auction.[461]

396. Moreover, Google Ads' rivals are small relative to Google Ads. [redacted][462] In a deposition, Eisar Lipkovitz explains that "if it's a small advertiser, frankly, [GDN is] the only thing they can do."[463,464]

---

[459] The Google Ads market share [D] is estimated as the product of AdX market share [A] and Google Ads' market share among all ad buying tools for small advertisers in AdX [C]. I do the calculation in two steps. First, AdX market share of indirect impressions calculated in Table 5 is used to approximate AdX's share in the ad exchange market for transacting indirect open web display advertising. Second, the RFP 53 AdX submission data is used to calculate the share of AdX impressions purchased by Google Ads among all ad buying tools for small advertisers in AdX. The column "transaction" is restricted to "OA – Open Auction" and "user device" does not include "MobileApp" or "TabletApp." The calculation includes all ad buying tools with positive impressions in the US ("imps_usa > 0") or positive gross revenue in the US ("gross_rev_usd_usa > 0"). The outcome is calculated from "imps_usa" aggregated at the annual level. All ad buying tools are ranked by their impressions in each year and the top-20 tools are selected. Ad buying tools are classified as DSPs or ad buying tools for small advertisers using public information on their offerings. There are more than 600 ad buying tools that won impressions in AdX from 2014 to 2023. [redacted] Among the top-20 ad buying tools, DSPs or tools operating outside of the US are disregarded. For this table, ad buying tools for small advertisers include Google Ads, Marketgid, TellApart, Netmining, ShareThis, Infectious Media IDB, Criteo (JP), Criteo (US), Yahoo - RMX - NA, Yahoo - Display & App (EB), and AppNexus. Criteo (JP) is included because it contains a large fraction of ad impressions in the US.

[460] Calculated based on impressions in the North America.

[461] [redacted]

[462] Deposition of [redacted]

397. In 2014, Google stated, "[redacted]."[465] Today, Google Ads enables advertisers to reach 90% of Internet users worldwide,[466] and as of 2019, [redacted].[467]

2) Small advertisers use a single ad-buying tool and face high costs when switching to another ad-buying tool

398. According to Professor John Chandler, an industry expert, small advertisers require ad tech tools that are straightforward, cost effective and easy to manage.[468] A 2008 paper on the economics of the online advertising industry explained that multi-homing was limited due to advertisers' "costs of setting up the platform, installing software, and learning how to use it."[469]

399. The CMA conducted a survey of advertisers, which showed that multi-homing is rare for small advertisers.[470] It explained that advertisers single-home because they do not perceive the need to use

---

[redacted]

[463] Deposition of [redacted], (Vice President of Engineering for Display and Video Ads at Google), 315:20-316:14, March 31, 2021 ("Q. I guess the thing that I'm trying to understand is, is it [GDN demand] differentiated because of the targeting and targeting technology? Is it differentiated because it's using different data signals? Is it differentiated because it's using -- it has small advertisers that are able to buy programmatically through it? […] A. I mean, Tim, literally it's all of the above, right. Really, the key point there is the advertiser is not in full control of each impression, because the advertiser chose to outsource that work to GDN, right. And if it's a small advertiser, frankly, that's the only thing they can do. Like they have no idea how to do anything better, right.").

[464] Similarly, in his deposition, [redacted] *See* Deposition of [redacted].

[465] [redacted]

[466] Google Ads Help. "Display Network: Definition" (undated). Accessed on May 22, 2024. https://support.google.com/google-ads/answer/117120?hl=en

[467] [redacted]

[468] Conversation with John Chandler, June 4th, 2024.

[469] Evans, David S. "The Economics of the Online Advertising Industry." *Journal of Economic Perspectives*, vol. 23, no. 3, 2008, p. 23.

[470] Competition and Markets Authority. "Online platforms and digital advertising: Market study final report" pg. 215 (July 1, 2020). https://assets.publishing.service.gov.uk/media/5efc57ed3a6f4023d242ed56/Final_report_1_July_2020_.pdf

another ad buying tool, and that that some advertisers don't have the knowledge, or resources to use an alternative.[471] Single-homing minimizes transaction costs.[472]

400. Even large advertisers, with greater resources than small advertisers, lack the ability to multi-home on buying tools. According to [redacted][473] Additionally, [redacted][474]

401. Small advertisers typically use a single ad-buying tool when buying search ads. That tool is generally Google Ads due to its wide reach.[475] Google Ads allows advertisers to purchase both search ads on Google's search engine and display ads on the open web. This results in Google Ads for display ads being the overwhelming choice for most small advertisers, given they are already using the tool to purchase search ads.[476]

402. [redacted][477] In a 2011

[471] Moreover, the CMA points out that "Amongst multi-homers, most were multi-homing solely using Facebook and Google. Only a minority were multi-homing using other providers in addition to Facebook and/or Google. Of those advertisers who were multi-homing, the majority spent much more on one provider than any others, indicating that they behaved similarly to those advertisers using only one platform." *See* "Competition and Markets Authority. "Online platforms and digital advertising: Market study final report - Appendix N: understanding advertiser demand for digital advertising" para. 50 (July 1, 2020). https://assets.publishing.service.gov.uk/media/5fe495d3e90e071205803985/Appendix_N__-_understanding_advertiser_demand_for_digital_advertising_WEB.pdf"

[472] Competition and Markets Authority. "Online platforms and digital advertising: Market study final report" pg. 242 (July 1, 2020). https://assets.publishing.service.gov.uk/media/5efc57ed3a6f4023d242ed56/Final_report_1_July_2020_.pdf

[473] Deposition of [redacted]

[474] Deposition of [redacted]

[475] Competition and Markets Authority. "Online platforms and digital advertising: Market study final report" pg. 227 (July 1, 2020). https://assets.publishing.service.gov.uk/media/5efc57ed3a6f4023d242ed56/Final_report_1_July_2020_.pdf. The CMA explained that large advertisers used ad tech tools such as SA360 to multi-home across buying tools.

[476] The ACCC recognized that "a large number of smaller advertisers single-home on Google Ads as their DSP, resulting in advertiser demand from Google Ads not only being very significant but also unique and exclusive." Australian Competition Consumer Commission. "Digital advertising services inquiry. Final report" pg. 59 (August 2021). https://www.accc.gov.au/system/files/Digital%20advertising%20services%20inquiry%20-%20final%20report.pdf

[477] Deposition of [redacted]

complaint to the European Commission, Microsoft explained that most advertisers single-home with Google's ad-buying tool. Microsoft stated: "Google is a "must-have" for advertisers, and they advertise on Google in massive numbers. […] For advertisers, it is often costly and burdensome to participate on platforms other than Google's. As explained above, this is largely because of Google's illegal conduct which induces advertisers to do business only with Google. Most advertisers single home on Google."[478]

3) The market for ad-buying tools for small advertisers for buying open web display advertising space is characterized by high barriers to entry

403. The market for ad-buying tools for small advertisers for buying open web display advertising displays high barriers to entry due to switching costs and data advantages.

404. Ad-buying tools rely on advertiser transaction data to inform bidding algorithms. The more bids successfully resulting in transactions, the more information the buying tool has available to adjust its bidding algorithms and improve them. Internal Google conversations demonstrate an awareness of how important it is for bidding models to train on auction win data to reveal the reward of an auction (e.g., the clicks and conversion that result when an ad is shown to the user).[479] Google emphasizes that these models require "a substantial amount of conversions… to be accurate," indicating the way these models benefit when Google wins more auctions.[480] This phenomenon of data scale benefits large incumbents like Google Ads, as it enables them to make product improvements and optimization that are hard for new entrants who lack similar data scale.

405. An ad-buying tool cannot achieve sufficient scale unless it can assemble a large number of customers and then develop algorithms that successfully bid on inventory. The more advertisers that bid through a buying tool; the more information is available to the buying tool to optimize bids for different ads and audiences. Google's discussions of HDMI, a bidding model for its buyside tools, discussed how that it was hard for the model to predict the auction value to advertisers and thus optimize bids because of a lack of data from DBM advertisers with only 15% of whom opted in to share data, in contrast to Google

[redacted]

478 GOOG-DOJ-32282538 at -627. May 4, 2011. "Complaint to the European Commission Google Inc. Infringements of Articles 101 and 102 TFEU." (May 4, 2011). Complaint submitted on behalf of Microsoft Corporation. Data produced by Google indicates that 1,205,425 advertisers use only Google Ads while 5,533 advertisers use both Google Ads and DV360. These later advertisers are typically larger than average.

479 GOOG-AT-MDL-004434946 at '947, "A brief overview of HDMI" (2020-07) - Internal Google document providing an overview of HDMI model ("we only learn the reward if we win the auction"); GOOG-NE-05279675 at '676, "HDMI bidding and first pricing" (No Date) – Internal Google launch document.

480 GOOG-NE-05279675 at -676. "go/hdmi-first-pricing" (September 4, 2019). Internal Google document detailing the 1P HDMI bidding model. ("While HDMI requires a substantial amount of conversions, which tend to be sparse, to be accurate…")

Ads where all advertiser data is collected. Again, Google understood that it was imperative for the company to have access to a large amount of advertisers to train such models.[481] Since the acquisition of DoubleClick, Google gave AdX exclusive access to Google's large pool of Google Ads advertisers.[482]

406. Google's ad-buying tools also benefitted from a data advantage in the market for ad-buying tools for small advertisers for buying open web display advertising because of Google's dominance in the market for publisher ad servers used for the sale of open web display advertising. In his deposition, [redacted][483] The CMA also found in its 2020 market study report that "Google Ads wins a higher number of noncompetitive auctions (auctions where there is only one eligible bidder above the floor price) compared to other types of bidders. [redacted]"

VI. GOOGLE TIED ITS PUBLISHER AD SERVER TO ITS EXCHANGE

407. I first examine tying which is one in a series of choices and actions on the part of Google that steered advertiser demand into Google's own exchange. The tie put publishers in a position that if they wanted to access that demand, they needed to use Google's ad server, DFP. For Google to do this, I first explain how Google established its monopoly power in the exchange market by limiting demand from a

[481] GOOG-NE-10250038 "Click-Through Conversion Prediction from DBM Shared Advertisers Based on Combined GDN-DBM Data" (2017-10-17) – Internal Google document on combining GDN and DBM data for training models foe DBM shared advertisers ("The issue with shared models is that their training data is rather small."); GOOG-DOJ-03151263 at -269, "DBM Optimization" (No Date) – Internal Google presentation discussing integration of GDN optimization strategies to DBM.
[482] GOOG-NE-12146934 at -936. "AdExchange Primer" (October 6, 2009). Google strategy document on AdX 2.0's key offerings and value proposition. ("How will Google's AdX differentiate from other exchanges? […] Access to AdWords advertisers[…]"); GOOG-TEX-00775735 at -743. "Display Strategy Working Document" (August 2012). Google internal strategy document for GDN. ("Specifically, we have chosen to limit GDN to buying only on AdX, an exclusivity that makes AdX more attractive to sellers.").
[483] Deposition of [redacted]

large set of advertisers to Google's own exchange.[484] Then, I explain how Google foreclosed publishers using third-party ad servers from selling to Google's exchange. Google effectuated these limitations through code on publishers' websites. In 2016, Google then imposed a contractual tie between its exchange and its publisher ad server.

408. I characterize these actions as a tying strategy pursued by Google to tie its ad server, DFP, to its exchange, AdX. As will be shown, a firm with sufficient monopoly power in one market can harm competition in a second market by conditioning the sale of the product in the first market (tying product) on the sale of the product in the second market (tied product). This is what Google was able to do.

A. Anticompetitive ties

409. A tie occurs when buyers in one market opt to purchase a specific provider's product in that market, but they must also purchase a specific provider's product in another market. Typically, when a tie is required, the specific provider in each market is the same firm. The impact of a tie is that if a buyer purchases a product in Market A from a specific provider, their options of whom to buy from in Market B are limited to the specific provider specified in the tie. A tie, therefore, imposes a restriction on buyers.

410. Nonetheless, economists do not consider tying two products to be intrinsically anticompetitive. For instance, in order to play Super Mario Bros, a consumer must purchase a Nintendo game console. While this does not preclude them from purchasing a Sony game console, the fact that Mario is unavailable on Sony does mean that the value of this console is lower for consumers. However, Sony itself can offer games that are not available on Nintendo along with a range of options available to consumers when selecting game consoles, so such tying is not necessarily anticompetitive.

411. This example also illustrates when anticompetitive harm may arise from tying. Nintendo had some monopoly over Mario as a specific game class. However, it had very little, if any, monopoly power over the games itself. Thus, by restricting Mario's availability, Nintendo likely did not alter the ability of other game console providers to compete and offer games to their consumers.[485] Thus, for tying to be

[484] For the balance of my report, I use 'ad server market' when referring to the market for publisher ad servers used for the sale of open web display advertising space; 'ad exchange market' when referring to the market for ad exchanges for transacting indirect open web display advertising space; 'ad buying tools for small advertisers' when referring to the market for ad-buying tools for small advertisers for buying open web display advertising space; and 'ad buying tools for large advertisers' when referring to the market for ad-buying tools for large advertisers for buying open web display advertising space.

[485] Tying also may, in some circumstances, be technically efficient *See,* Evans, David S. and Padilla, Jorge and Ahlborn, Christian. "The Antitrust Economics of Tying: A Farewell to Per Se Illegality" (April 21, 2003); *See also,* Whinston, Michael. "Exclusivity and Tying in U.S. vs Microsoft: What We Know, and Don't Know." *Journal of Economic Perspectives* vol.15, no.2. 2001. pgs.63-80.

anticompetitive, the tie must involve a product that is sold by a provider with some degree of monopoly power in the tying market.[486]

412. When such a provider ties a product from a market where it has enough monopoly power to force buyers to alter their decisions to a specific product in a more competitive market, this creates a situation in which the tie is able to alter the competitive conditions in the tied market. This might arise in the form of higher prices,[487] lower innovation[488] and entry deterrence.[489] In the late 1990s and 2000s, Microsoft tied its browser, Internet Explorer, to its monopoly operating system Windows. This tie was undertaken in response to the perceived threat of browsers such as Netscape to Microsoft's Windows monopoly. As a matter of economics, the tie between Windows and Internet Explorer harmed competition in the operating systems market by raising barriers to entry for nascent competitors.[490]

413. Thus, having a degree of monopoly power in one market can provide a firm with the ability to use tying to impact competition in another market. This raises the question of when a firm with that ability will have the incentive to engage in a tie for that purpose. For example, a tie may involve buyer dissatisfaction and thus, those losses in profits may need to be recouped through higher profits as a result of a reduction in competition.[491] However, it is also the case that when there are highly competitive conditions in the tied market, those costs in terms of lost profits may be low, and the resulting shift in competitive conditions is quite significant.[492] When coupled with high switching costs or network effects, the profitability of engaging in an anticompetitive tie may be considerable.[493]

---

[486] Tirole, Jean. "The analysis of tying cases: A primer." *Competition Policy International* vol. 1, no. 1. 2005. pgs.1-25.
[487] Carlton, Dennis W., and Michael Waldman. "How Economics Can Improve Antitrust Doctrine Towards Tie-In Sales: Comment on Tirole's 'an Analysis of Tying Cases: A Primer."" *Competition Policy International* vol.1, no. 1. 2005. pgs.27-40.
[488] Carlton, Dennis & Waldman, Michael. "The Strategic Use of Tying to Preserve and Create Market Power in Evolving Industries" *RAND Journal of Economics* vol.33, no.2. 2002. pgs.194-220; *See also,* J.P. Choi & C. Stefanadis. "Tying, Investment, and the Dynamic Leverage Theory." *RAND Journal of Economics* vol.32, no.1. 2001. pgs. 52-71.
[489] Whinston, Michael. "Tying, Foreclosure, and Exclusion." *American Economic Review* vol. 80, no.4. 1990. pgs. 837–859; *See also*, Nalebuff, Barry. "Bundling as an Entry Barrier." *Quarterly Journal of Economics* vol.119, no.1. 2004. pgs. 159-187; Nalebuff, Barry J. "Tied and True Exclusion: Comment on Tirole's 'An Analysis of Tying Cases: A Primer'." *Competition Policy International* vol.1, no. 1. 2005. pgs.41-53.
[490] Franklin M. Fisher and Daniel L. Rubinfeld. "U.S. v. Microsoft – An Economic Analysis." UC Berkeley School of Law Public Law and Legal Theory. Working Paper No. 30. 2000. Pg. 3. ("Microsoft's conduct, which preserved and increased barriers to entry into the PC operating system market, included: a. Tying its browser to the operating system (in effect requiring manufacturers to acquire Microsoft's Internet browser as a condition of acquiring Microsoft's Windows operating system), thereby severely hampering Netscape in browser competition and blunting the threat that software developers, writing for a browser platform, would write to one not under Microsoft's control."
[491] Tirole, Jean. "The analysis of tying cases: A primer." *Competition Policy International* vol. 1, no. 1. 2005. pgs.1-25.
[492] Nalebuff, Barry J. "Tied and True Exclusion: Comment on Tirole's 'An Analysis of Tying Cases: A Primer'." *Competition Policy International* vol.1, no. 1. 2005. pgs.41-53.
[493] Carlton, Dennis W., and Michael Waldman. "Upgrades, switching costs and the leverage theory of tying." *The Economic Journal* vol.122, no. 561. 2012. pg.675-706.

414. The conditions for competitive injury from tying are present in this case. Here, Google tied its AdX ad exchange with its DFP ad server. These are independent products with separate demand for each product. Google conditioned the use of AdX (the tying product) with the sale of its DFP ad server (the tied product). In earlier sections of this report, I showed that Google has monopoly power in both markets in which these products participate. As I show in Section VI.C., the result of this conduct is foreclosure of competition in the ad server market for open web display advertising, which enhanced and protected Google's monopoly power in this market and harmed publishers.

B. Timeline and functioning of Google's tying conduct

415. Since the early days of its exchange and ad server offerings, Google has engaged in a systematic effort to use its monopoly power in the exchange market to exclude competition in the ad server market. Google's tying conduct involved three of its AdTech tools at different time periods: Google's ad server (DFP), Google's ad exchange (AdX), and Google's ad-buying tool for small advertisers (AdWords, later Google Ads).

416. Google's systematic efforts to exclude competition and increase monopoly power in the ad server market followed the chronology below, which I explain in subsequent sections of this report:

a. In 2008, Google **automatically enrolled** advertisers using Google's ad-buying tool for small advertisers (AdWords, later Google Ads) to buy search advertising into using the same ad-buying tool to buy display advertising. This created a large and largely unique volume of advertisers using Google's ad buying tool for small advertisers to buy display advertising.

b. Around the same time, Google limited its ad-buying tool for small advertisers to Google's ad exchange (AdX), making Google Ads demand **exclusive** to AdX amongst exchanges, and leading publishers to consider AdX a "must-have" exchange.

c. Starting in 2009, Google imposed **technical limitations** preventing publishers using third-party publisher ad servers from selling to Google's ad exchange (AdX) in real-time open auctions.

d. Starting in 2016, Google **contractually tied** its ad exchange (AdX) and its publisher ad server (DFP), meaning that publishers wanting to access AdX demand in any form (in real-time or otherwise) were forced to sign a combined DFP-AdX contract.

417. Notice that Google's actions can be classified into two groups. The first was to funnel advertiser demand through AdX; these were the actions described in the previous paragraphs that took place in 2008 and 2010. The second was to ultimately tie AdX and DFP; these were the actions described in the previous paragraphs that took place in 2009 and 2016. In what follows, I describe and analyze the buy-side conduct before turning to the sell-side conduct and consequences. To anticipate, I also separately discuss Google's conduct with respect to Dynamic Allocation in Section VII.B, which restricted the ability of publishers to deal with non-Google exchanges. While the analysis is separate for expository reasons, the cumulative effect of both classes of conduct is greater.

1) In 2008, Google automatically enrolled Google Ads' search advertisers into buying display advertising via the same tool, creating a large base of advertisers using Google Ads to purchase display advertising

418. As online display advertising gained adoption, Google enrolled advertisers in both its search and display networks by default.[494] In 2009, 80% of advertisers purchasing ads online used Google's AdWords for search advertising.[495] Advertiser budgets in AdWords would automatically be spent across search and display, unless the advertiser changed the default setting.[496]

419. This provided many small advertisers with their first exposure to display advertising and created a large base of small advertisers using AdWords to purchase display ads. Small advertisers tend to single-home in buying ad tech tools for display advertising due to the costs of adopting and using a second tool.[497] Thus, most of the advertisers using AdWords to purchase display advertising did not purchase display advertising using another ad buying tool.

[494] GOOG-DOJ-17360264 at -318. "adspro" (November 26, 2010). Internal Google email newsletter from [redacted]. ("The Google Network is split into the Search Network […] and the Display Network […]. By default, AdWords keyword-targeted campaigns are opted into the entire Google Network: Google search, search partners, and the Display Network").; Measure School. "How to Setup a Google ads Search Campaign (and avoid fatal mistakes)" (June 29, 2023). Accessed on June 1, 2024. https://measureschool.com/google-ads-search-campaign/

[495] AdExchanger. "Agencies Want Transparency; Google AdX 2.0 Exchange In Two Weeks?; Almost Real-Time Ads" (September 11, 2009). Accessed on June 1, 2024. https://www.adexchanger.com/ad-exchange-news/agencies-want-transparency-google-adx-2-0-ad-exchange-in-two-weeks-real-time-ads/

[496] GOOG-DOJ-17360264 at -318. "adspro" (November 26, 2010). Internal Google email newsletter from [redacted]. ("The Google Network is split into the Search Network […] and the Display Network […]. By default, AdWords keyword-targeted campaigns are opted into the entire Google Network: Google search, search partners, and the Display Network").

[497] Conversation with Prof. John Chandler, June 4th, 2024.

2) In 2010, Google made its ad-buying tool exclusive to AdX

420. With the acquisition of DoubleClick in 2008, Google entered the publisher ad server and ad exchange markets. In 2009, Google relaunched DoubleClick's exchange as AdX 2.0.[498] As part of this revamp, Google made its ad-buying tool for small advertisers (AdWords) exclusive to its exchange, AdX.[499] Consequently, publishers could only access these small advertisers' demand through AdX.

421. Because small advertisers' single-home on ad-buying tools and use default features, Google consequently turned its large pool of small advertisers using AdWords for search advertising into an exclusive pool of display advertisers, only accessible to publishers via AdX. [500] Google's large pool of advertisers willing to purchase display ads via AdWords originated from Google's dominant position in search advertising. In 2010, Google was the leading firm in terms of search advertising, reporting nearly [redacted] in search advertising revenue for the year. The next closest competitor, Microsoft, reported only $1.2 billion in search ad revenue for the year.[501]

422. This transformed AdX into a "must-have" exchange.[502] As large volumes of advertiser demand were not available on other exchanges.[503] According to [redacted]

[498] Google Blog. "The DoubleClick Ad Exchange: growing the display advertising pie for everyone" (September 17, 2009). Accessed on June 1, 2024. https://googleblog.blogspot.com/2009/09/doubleclick-ad-exchange-growing-display.html. ("Today we're excited to announce the new DoubleClick Ad Exchange")
[499] GOOG-NE-12146934 at -936. "AdExchange Primer" (October 6, 2009). Google strategy document on AdX 2.0's key offerings and value proposition. ("How will Google's AdX differentiate from other exchanges? […] Access to AdWords advertisers[…]"); GOOG-TEX-00775735 at -743. "Display Strategy Working Document" (August 2012). Google internal strategy document for GDN. ("Specifically, we have chosen to limit GDN to buying only on AdX, an exclusivity that makes AdX more attractive to sellers.").
[500] GOOG-NE-12146934 at -936. "AdExchange Primer" (October 6, 2009). Google strategy document on AdX 2.0's key offerings and value proposition. ("How will Google's AdX differentiate from other exchanges? […] Access to AdWords advertisers[…]")
[501] eMarketer. "Search Ad Revenues, by Company, US" (eMarketer Forecast, 2024). Accessed on June 5, 2024. (Search results filtered for "search ad revenues, by company, in 2010")
[502] In response to the ACCC inquiry, Free TV Australia describes AdWords demand as "very significant" and explains that this leads publishers to be forced to adopt Google's products to have access to this valuable demand. See Australian Competition Consumer Commission. "Submission by Free TV Australia" pg. 12. (May 1, 2020). https://www.accc.gov.au/system/files/Free%20TV%20%2822%20May%202020%29.pdf
[503] *See* Section V.D. *See also* Deposition of [redacted] *See also* Deposition of [redacted]

[redacted]."[504]

3) AdWords demand for programmatic buying via exchanges was exclusive to AdX until 2013, with the introduction of AWBid[505]

423. AWBid is a Google program that allowed AdWords limited access to third party ad exchanges for the exclusive purpose of purchasing remarketing impressions.[506] AWBid had limited impact on AdWords' exclusivity to AdX, reflecting the limits Google imposed on the program.[507] According to [redacted][508] The limited availability of AdWords demand through third party exchanges meant that the "must-have" nature of AdX to publishers persisted beyond 2016.

4) Starting in 2009, Google imposed technical limitations on access to AdX for publishers using third-party ad servers

424. Publishers using third-party ad servers could historically access AdWords demand via AdX by calling Google's exchange in the Waterfall. However, third-party ad servers did not have access to real-

[504] Deposition of [redacted]

[505] GOOG-DOJ-14826533 at -533. "Re: AwBid Update Draft *PLEASE CHECK ASAP*" (February 11, 2019). Internal Google email thread with [redacted], [redacted], [redacted], [redacted], [redacted], [redacted], [redacted], [redacted], and others. (Email confirms AWBid was developed in 2011); *See also,* GOOG-DOJ-27759140 at -142. "AWBid - OpenX" (November 2013). Internal Google presentation on cross-exchange remarketing. (Document describes AwBid launched its pilot project in 2013 with the goal to "evaluate scaling AWBid to more advertisers")

[506] GOOG-DOJ-27759140 at -142. "AWBid - OpenX" (November 2013). Internal Google presentation on cross-exchange remarketing. ("AdWords Cross-Exchange Buying (AWBid) is a pilot program that helps AdWords advertisers reach a greater share of users on their remarketing lists, driving incremental conversions by extending their remarketing campaigns beyond GDN to multiple partner ad exchanges.")

[507] Google produced data shows that, up to June 2016, all AdWords impressions sold through exchanges were transacted through AdX only (i.e. not through third party exchanges). After June 2016, the maximum monthly share of Google Ads impressions purchased from non-Google exchanges was less than 9%. Data sourced from XP dataset. Filters: The format the ad is in (Display, Video, etc.) "ad_format" = Display; The device environment the user generated the impression "environment" = Desktop, Mobile Web, Web. The transaction type of the ad being served as is identifiable from the traffic in scope "transaction_type" = Open Auction -- Open Auction transactions are auction-based transactions for inventory available to all buyers. Data aggregated by "Month" and shares calculated.

[508] Deposition of [redacted]

time AdX demand. Over time, Google progressively eroded even the limited access rival ad servers had to AdWords demand (exclusive to AdX). Instead, Google promoted the adoption of "GPT tags," a technology that allowed Google's ad server to control access to AdX demand.

425. The functioning of ad tags provides context for understanding how Google used its exchange market power to impose limitations on publisher choice of publisher ad server. In this section, I outline the relevant details of ad tag functioning. Then, I discuss the limitations imposed by Google, with the aim of growing Google's publisher ad server market share and power over publisher inventory.

426. An ad tag is a piece of code that publishers put on their website in order to sell ads.[509] A publisher generates an ad tag using a publisher ad server and inserts the ad tag into their website's html code.[510] When a user visits a publisher's website, the code for the ad tag runs and sends a signal for an ad request to the publisher's ad server.[511] Based on the information provided by the ad tag, the publisher ad server runs its decisioning logic and identifies a winning ad to serve in the ad slot.[512] The winning demand source sends the ad, via a reference URL, to the publisher's ad server. The publisher ad server then serves the ad creative to the user visiting the web page by loading the finalized ad tag on the web page.[513]

427. Ad tags thus play an important role in the sale of publisher ad inventory, triggering the ad server to begin the process of selling an ad slot or connecting directly with a demand source to sell an ad slot. Google recognized this important role and designed a strategy to drive adoption of Google's ad tags in order to control the sale of publisher ad inventory – this was Google's "own the tag" strategy.[514]

428. Google used the "own the tag" strategy to control access to publisher inventory and "make even more money."[515] Google viewed the "own the tag" strategy as "absolutely vital to winning" and

[509] AdPushup. "What are Ad Tags and Why Do They Matter?" (March 29, 2024). Accessed on June 1, 2024. https://www.adpushup.com/blog/ad-tags/
[510] HeaderBidding. "Ad Tag Explained: What it is and How to Crete one" (updated April 15, 2024). Accessed on June 1, 2024. https://headerbidding.co/ad-tag/#The_Role_of_Ad_Tags_in_Advertising
[511] Epom. "What is an Ad Tag and How to Generate It [Examples Inside]" (March 11, 2020). Accessed on June 1, 2024. https://epom.com/blog/ad-server/what -is-an-ad-tag
[512] GOOG-NE-09174317 at -326. "Programmatic Guaranteed User Day" (April 2019). External Google presentation on programmatic guaranteed. ("Ad manager has a complex logic in place to decide which Lis should compete for an impression and a number of factors are considered before determining which line item wins (priority, line item type, cpm and pacing).").
[513] AdButler. "What is an ad tag? The role of ad tags in serving ads" (April 28, 2021). Accessed on May 13, 2024. https://www.adbutler.com/blog/article/what -is-an-ad-tag#How-do-ad-tags-work?
[514] GOOG-DOJ-28420330 at -338. (May 23, 2017, *per metadata*). Internal Google document on how Google demand sources should respond to the growing trend of header tag implementation. ("Today, 'own the tag' means placing the Google Publisher Tag (GPT) on the page directly so Google owns the decision logic via DFP across all demand sources.").
[515] GOOG-AT-MDL-B-005461839 at -839. "Own the Tag Strategy" (undated). Google internal document describing "own the tag" strategy.

remaining the "platform of choice" for publishers and developers.[516] For example, Google viewed The New York Times as one of their "most strategic publishers" and "getting access to all of the NYT's inventory" fulfilled Google's "own the tag" strategy.[517] In Google's view, having Google ad tags on publisher websites was essential so that Google could control the ad serving logic and ensure Google's demand sources (including Ad Words and DV360 through AdX) could bid on all publisher inventory.[518] Google's objective with this strategy was to control demand access to publishers' inventory and, in turn, set the terms of access for Google demand and third-party demand sources.[519] Google leveraged its market power in AdX to pursue this strategy.

429. Historically, publishers used multiple ad tags, each associated with a different demand source.[520] Google offered publishers two types of ad tags. The first, known as "AdX tags" (also referred to as AdX Direct Tags), enabled AdX to be called by third-party ad servers to serve an ad. When an AdX tag is placed on a publisher's website, the tag does not compete against other inventory in an auction. Rather, the AdX tag follows a binary operation that either serves an ad or does not serve an ad via AdX. AdX tags have no technical means to access real-time bidding on AdX.[521]

430. [redacted]

---

[516] GOOG-NE-12468547 at -557. "PBS Competitive Sessions Facebook & F8 2015" (April 2015). Internal Google presentation describing competitive threat from Facebook.
[517] GOOG-TEX-01230719 at -730. "The New York Times PBSx/BCDR Review" (February 2013). Internal Google presentation detailing The New York Times' deal with DFP.
[518] GOOG-NE-04442479 at -483, -493. "Header Bidding Observatory #2" (May 2017). Internal Google presentation detailing Header Bidding adoption.
[519] GOOG-DOJ-28420330 at -338. (May 23, 2017, *per metadata*). Internal Google document on how Google demand sources should respond to the growing trend of header tag implementation. ("Today, 'own the tag' means placing the Google Publisher Tag (GPT) on the page directly so Google owns the decision logic via DFP across all demand sources.").
[520] GOOG-NE-13507556 at -556. "Proposal: Making GPT 1st Tag on Page" (April 18, 2018). Internal Google proposal document. ("Publishers have increasingly been integrating 3rd-party ads-related tags on their pages (including header bidding wrappers, DMP tags, and more), and as a result, have lost control over the latency of their ad queries, the security of ads served to their users, and the usersyncing activity that occurs on their pages.")
[521] Deposition of [redacted]

[redacted].[522] Since AdX was a must-have exchange for publishers, this made rival publisher ad servers less attractive and led publishers to use DFP.

431. Around 2010,[523] Google developed the second ad tag offered to publishers. "Global Publisher Tags" (GPT), which were enabled only by Google's publisher ad server DFP. GPT announced a user web page visit to DFP and used a single request for multiple ads on the page at the same time ("global"). GPT was launched in 2011.

432. AdX Tags had limitations compared to GPT tags. AdX Tags were ineligible to match specific deal types, impacting access to real-time Google demand.[524] GPT was the key step in Google's "own the tag" strategy and the tool by which Google could control demand-side access to a publisher's inventory. Once DFP's control of publisher inventory was established, Google could implement programs including Dynamic Allocation, Enhanced Dynamic Allocation and Unified Pricing Rules. These are discussed in Section VII of my report.

433. A 2017 Google strategy document noted the success of Google's use of AdX monopoly power and tag limitations to drive adoption of DFP: "That [own the tag] strategy has served us well for a long time because it means we control the decision logic and we can ensure all the incredible work our engineers put into making our ad server and exchange work together makes the best decision on behalf of our pubs…The fact that AdX demand could bid and win in real-time against our tag-based indirect competition and ultimately against directly sold ads was key to establishing ourselves as a preferred holistic yield management partner to a great many pubs across the globe."[525]

[522] Deposition of [redacted]

[523] GOOG-TEX-00651745 at -747. "[xfp-tech] 2010 in Review - xFP FE" (December 9, 2010). Internal email newsletter from [redacted] on main XFP updates.

[524] GOOG-AT-MDL-004288612 at -643. "Ad Unit Stuff" (January 25, 2017). Internal Google meeting notes. ("If you have an AdX tag on a page, and DFP ad units that were created because they are mapped to the adx ad slot that matches that tag and then target the ad unit in PD or PG, it won't break, but the deal would never get called b/c the tag is not eligible for those types of deals")

[525] GOOG-NE-04442479 at -483, -493. "Header Bidding Observatory #2" (May 2017). Internal Google presentation detailing Header Bidding adoption.

434. By 2019, Google was intent on deprecating AdX Tags, which gave 3rd party ad servers access to AdX demand.[526] Thus, Google intended to remove even this subpar method of publishers accessing AdX demand using third party ad servers.[527] As a consequence, DFP's market share grew significantly from 2010 to 2016.

5) Google considered extending access to real-time AdX demand for third-party ad servers but decided not to pursue this option to maintain its exclusive access to real-time AdX demand

435. As early as 2009, Google had technology that allowed third-party ad servers to solicit bids in real-time from AdX in a way that benefited publishers. Google, however, elected not to bring that technology to market.

436. Starting in 2009, Google planned to extend access to AdX demand in real-time via Dynamic Allocation to third-party ad servers (or 3P-DA).[528] Although this rollout of 3P-DA was technically feasible and close to deployment for at least some locations,[529] Google decided not to fully launch this integration option to maintain its exclusive access to real-time AdX demand.

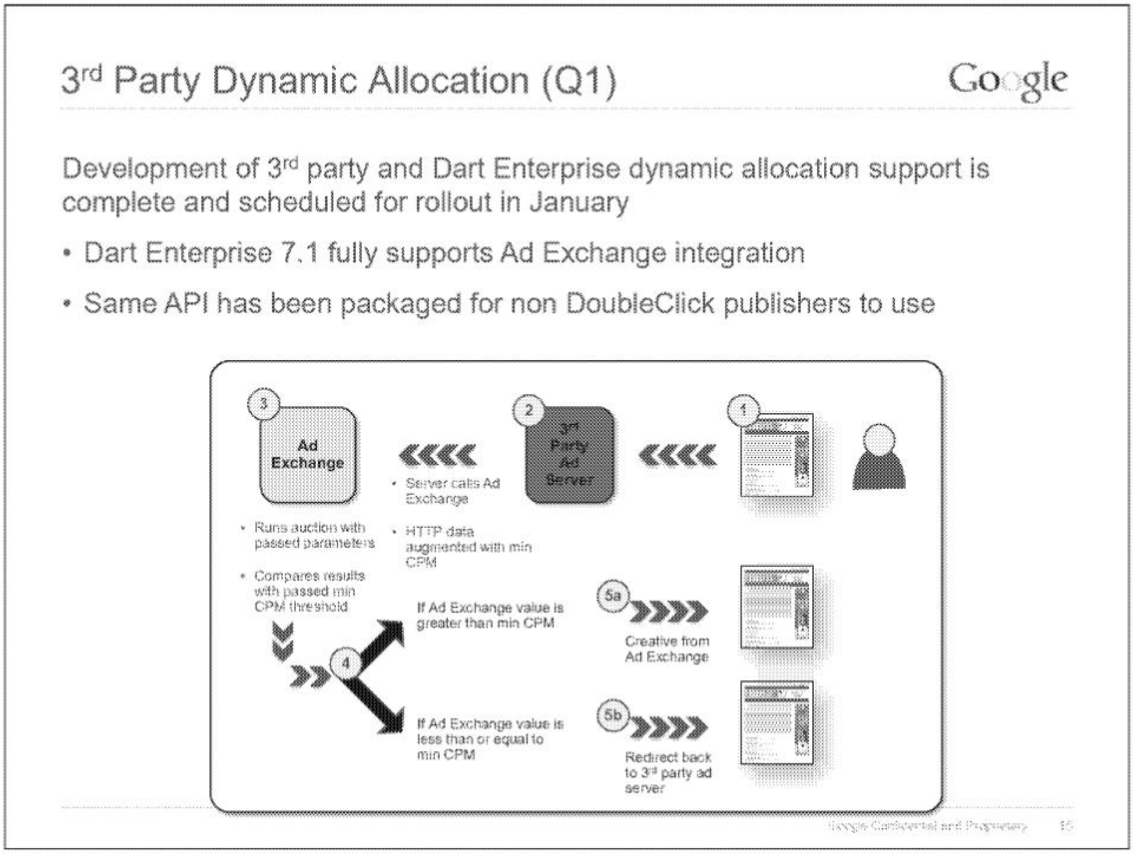
437. This rollout of 3P-DA was technically feasible according to Google: "Development of 3rd party Dart Enterprise dynamic allocation support is complete and scheduled for rollout in January."[530] In December 2009, an internal presentation, reproduced in Figure 11 below, described the implementation to be deployed in the following month, saying that the development of the third-party ad server uses an API to send AdX a minimum CPM to beat.[531]

Figure 11

Google Internal Description of how Third-Party Ad Servers would Access AdX in Real Time Starting January 2010[532]

---

[526] GOOG-DOJ-AT -01806366 at -369. "AdX Direct deprecation" (2019). Internal Google presentation for GTM Leads Meeting on Google's plan to deprecate AdX Direct. (Google presented a plan to deprecate AdX tags by "disable[ing] all means of calling Google demand that are relying on the Ad Exchange tag. This includes: Ad Exchange Tags called from a 3rd party ad servers")
[527] GOOG-NE-06828368 at -380. "Big Rocks: DFP/AdX/AdMob" (April 3, 2014). Internal Google document on the DFP/AdX unification. The document shows Google's intention to implement a strategy to deprecate AdX tags.
[528] In Section VII.B, I consider Dynamic Allocation more broadly as an ad server implementation that would allow real-time bidding via AdX and other ad exchanges; a technically feasible option that an independent ad server would want to implement.
[529] 3P-DA was in Beta version in 2012. GOOG-AT-MDL-017581528 at -588. "Display Strategy Working Document" (August 2012). Internal Google document discussing AdX growth, among other topics.
[530] GOOG-AT-MDL-B-004260508 at -522. "Partnership Discussion" (December 9, 2009). Internal Google presentation.
[531] GOOG-AT-MDL-B-004260508 at -522. "Partnership Discussion" (December 9, 2009). Internal Google presentation.
[532] GOOG-AT-MDL-B-004260508 at -522. "Partnership Discussion" (December 9, 2009). Internal Google presentation.



438. Another internal presentation describing the 3P-DA strategy suggested a phased rollout to "select proprietary 3rd party players. Message that the API will be made more broadly available but focus resources on active prospects only."[533] Indeed, by August 2012, Google notes that "Dynamic allocation for 3rd parties is available today but in beta."[534] A 2013 email also confirms that Google allowed "browser-side third party dynamic allocation to some whitelisted publishers."[535] Google also considered enabling third-party Dynamic Allocation for custom ad servers.[536]

439. A 2013 email also showed that Google considered extending Dynamic Allocation to other third-party ad servers: "The question [remains], as well as whether we should be friendlier to third-party serving stacks, opening up dynamic allocation to everyone and potentially offer other integration points

---

533 GOOG-AT-MDL-014602546 at -549. "AdX Dynamic Allocation API Strategy" (undated). Internal Google document describing a strategy to launch 3P-DA.
534 GOOG-AT-MDL-017581528 at -588. "Display Strategy Working Document" (August 2012). Internal Google document discussing AdX growth, among other topics.
535 GOOG-DOJ-14248551 at -551. "Re: AdX TOS effectively prohibits publisher from using an adserver?" (March 22, 2013). Google internal email on AdX policy.
536 GOOG-DOJ-14234662 at -662. "3rd party dynamic allocation for non DFP/XFP clients" (December 15, 2011). Internal Google email from [redacted]. ("Publishers with customer ad servers will be able to dynamically call into AdX.")

(like allow calling AdX twice, once private, once open exchange)."[537] Google dedicated engineering resources to this issue. In an email, an engineer states: "I am an eng on AdX, thinking about our integration with third party ad servers."[538] Moreover, the document clearly stated that the cost of Google pursuing this strategy was low. It claims that "minimal effort is require to roll [DA] out more" and that the effort required is only the commercialization of the product.[539]

440. However, Google thought that rolling out 3P-DA would prevent it from maintaining its exclusive access to real-time AdX demand. The strategy document showed that rolling out DA more broadly would risk eliminating a "key differentiator for DFP."[540] Dynamic Allocation is a key part of AdX positioning and enabled Google to maintain its power in the market despite offering fewer features than its competitors and other third-party solutions.[541]

441. In an internal email from the same period, a Google employee explained why Google should not pursue an "AdX integration."[542] He stated that: "it is too early to give AdX to non-XFP [DFP] partners" and that "This is an amazing time to 'lock in' impressions by offering XFP to publishers with full AdX dynamic allocation. AdX can serve as a tool to pull publishers onto XFP. By allowing third parties to integrate with AdX mobile web/app we are giving away this advantage. Dynamic allocation allows AdX to see all XFP impressions. We lose this advantage behind other ad servers."[543] In 2013, [redacted] described this strategy as follows: "Our goal should be all or nothing – use AdX as your SSP or don't access to our demand. It's a key feature and we need to use it while it's still proprietary to AdX."[544]

442. In 2011, Google also had a policy to restrict "calling AdX from a yield manager or exchange when there [was] AdX sub-syndication (i.e., network partners) in place."[545] In 2013, an engineer stated in an email: "Ouch. […] If dynamic allocation from third party ad servers is explicitly prohibited by our

---

[537] GOOG-DOJ-14248551 at -551. "Re: AdX TOS effectively prohibits publisher from using an adserver?" (March 22, 2013). Google internal email on AdX policy.
[538] GOOG-DOJ-14248551 at -551. "Re: [adx-questions:10197] TYM question" (March 22, 2013). Google internal email on AdX policy.
[539] GOOG-NE-05243813 at -873, -874. "Display Strategy Working Document" (August 2012). Internal Google document explaining platforms and strategies.
[540] GOOG-NE-05243813 at -873. "Display Strategy Working Document" (August 2012). Internal Google document explaining platforms and strategies.
[541] GOOG-NE-05243813 at -861. "Display Strategy Working Document" (August 2012). Internal Google document explaining platforms and strategies. ("Publishers […] want to be able to onboard data from third-party DMP's, from their own CRM systems, from social media platforms/services they work with to use for analysis and ad campaigns that they sell. Google doesn't support the vast majority of this functionality in any robust way, so publishers are increasingly turning towards third-party solutions – DMP's, fingerprinting companies, AppNexus, Salesforce.com, etc.")
[542] GOOG-AT-MDL-012473362 at -362. "Adx Mobile Stand Alone" (September 10, 2012). Google internal email.
[543] GOOG-AT-MDL-012473362 at -362. "Adx Mobile Stand Alone" (September 10, 2012). Google internal email.
[544] GOOG-DOJ-15600216 at -216. "Re: TMG,AdX and …..Rubicon" (January 30, 2013). Google internal email.
[545] GOOG-AT-MDL-008148529 at -529. "Re: AdX TOS effectively prohibits publisher from using an adserver?" (March 22, 2013). Internal thread between [redacted], [redacted], [redacted], [redacted], [redacted].

terms of service, that seems pretty bad."[546] In a 2013 email, [redacted] explained: "This was a strategic decision. We allow redirection from 3rd party ad servers, but not from other exchanges or yield managers. Why? Because if we did then those systems would immediately have a super set of demand – anything the SSP had + all of AdX (including AdWords). No one would sign up for AdX directly."[547] As Google summarizes in an internal presentation: "Yield managers can block our access. AdExchange Levels the Field."[548]

443. Google continued to consider enabling 3P-DA for custom ad servers.[549] "Publishers with customer ad servers will be able to dynamically call into AdX."[550] Drew Bradstock explained the impact of the launch would create greater spend on AdX, avoid custom ad servers pushing AdX down the priority, and increase penetration of markets and accounts.[551]

6) In 2016, Google contractually tied AdX and DFP

444. DFP and AdX are separate products. Publishers have separate demand for DFP and AdX, as evidenced by the usage of GPT (publishers using DFP) and AdX Tags (publishers using AdX, albeit in a limited manner). Prior to the contractual tie, some publishers wanted to access AdX without adopting Google's DFP, and DFP was used with exchanges other than AdX. Moreover, Google considered these ad tech tools separate even after the contractual tie.[552]

445. In addition, as described earlier, Google has monopoly power in the ad exchange market. For purpose of the contractual tie, AdX is the tying product. In Section VI.C, I describe how the contractual tie foreclosed competition in the tied market.

---

546 GOOG-DOJ-14248551 at -551. "Re: [adx-questions: 10197] TYM question" (March 22, 2013). Internal Google email shared by [redacted].
547 GOOG-AT-MDL-008148529 at -530. "Re: AdX TOS effectively prohibits publisher from using an adserver?" (March 22, 2013). Internal email thread between [redacted], [redacted], [redacted], [redacted], [redacted].
548 GOOG-AT-MDL-014598098 at -110, -116. "doubleclick ad exchange Intermediate Training" (undated). Internal Google training presentation.
549 GOOG-DOJ-14234662 at -662. "3rd party dynamic allocation for non DFP/XFP clients" (December 15, 2011). Internal Google email from Drew Bradstock. ("Publishers with customer ad servers will be able to dynamically call into AdX.")
550 GOOG-TEX-00074852 at -855. "DoubleClick Ad Exchange for Publishers" (undated). Google PowerPoint presentation on Dynamic Allocation.
551 GOOG-DOJ-14234662 at -662. "3rd party dynamic allocation for non DFP/XFP clients" (December 15, 2011). Internal Google email from Drew Bradstock. ("Impact - Greater spend on AdX by pubs due to the resulting higher yields seen through dynamic allocation - Custom ad servers currently assign a flat rate to AdX's yield which is often far lower than the real number and pushes us down the priority – Penetration of markets and accounts with custom servers who would have been closed to us otherwise")
552 GOOG-AT-MDL-000992438 at -438. "The Google Ad Manager (fka DRX) for Perf" (March 2022). Internal Google document describing Google Ad Manager. ("Google Ad Manager (internally and formerly known as "DRX") represents the merger of two flagship sell-side products: *DoubleClick for Publishers* ("DFP") and the *Google Ad Exchange* ("AdX"). The merger began in September of 2014 and concluded in mid-2018. We have now retired the DoubleClick brand, but internally, the products are still referred to as DFP and AdX.")

446. In 2014, Google began to combine DFP and AdX into a single offering, internally referred to as "DRX". By June 2016, Google made the Unified DFP/AdX Contract (DRX Contract), a contract for DFP and AdX, the default and prevented the creation of new AdX-only contracts.[553] Legacy AdX contracts remained legally valid post-June 2016 "unless terminated by Google, by the partner, or superseded by another AdX contract/ unified DFP/AdX contract."[554] A 2019 presentation summarized: "Google Ad Manager is the only way to access Google Ad Exchange as a publisher."[555] Rather than any benefit to publishers, Google's motivation for enacting the tie between AdX and DFP was to counteract a new source of demand that publishers could access outside of AdX, one that threatened to upend Google's highly effective own-the-tag strategy.

447. Google's decision to contractually tie AdX and DFP was intended to reduce the threat posed by Header Bidding to Google's ad server monopoly.[556] The rise of Header Bidding increasingly provided publishers with alternative sources of demand. Header Bidding also provided advertisers with an effective alternative route to DFP publisher inventory, outside of AdX. Between 2014 and 2018, Header Bidding increasingly posed a threat to Google's ad server monopoly and ability to funnel transactions to its exchange.[557] Google feared Header Bidding could evolve as an alternative inventory manager and remove DFP's control over publisher inventory.[558]

---

[553] GOOG-DOJ-AT -01128809 at -823. "DRX* Contracting Guide" (September 21, 2020). External Google PowerPoint on DFP and AdX contracts. ("The Unified DFP/AdX Contract is the default contract (since June 2016) for both DFP (SB or Premium) and AdX. It is sometimes referred to as a DRX Contract."); *See also*, GOOG-DOJ-AT -01128809 at -828. "DRX* Contracting Guide" (September 21, 2020). External Google PowerPoint on DFP and AdX contracts. ("Legacy AdX Contracts are standalone AdX contracts that were used from 2011-2016. These contracts cannot be created since summer 2016, following the move to new unified contracts."); *See also* Deposition of [redacted] (Product Go To Market, Google), 183:13-184:24, Apr. 12, 2024 ("Q. …[I]t does look like it is a combined DFP and AdX contract that […] became effective in July 1st of 2016. Do you see that? A. Yes. […] Q. Do you know why Google was unifying contracts in 2016? A. It would have been for the same -- for the same -- for the combined DFP and AdX product.").

[554] GOOG-DOJ-AT -01128809 at -828. "DRX* Contracting Guide" (September 21, 2020). External Google PowerPoint on DFP and AdX contracts.

[555] GOOG-AT-MDL-001004706 at -728. "Ad Manager Ecosystem 101" (June 2019). Internal presentation introducing the ads ecosystem by gTech.

[556] GOOG-TEX-00089241 at -242, -243. "Re: The REAL Header Bidding Threat …" (October 15, 2015). Internal Google email thread with [redacted], [redacted], [redacted], and [redacted] ("Right now we are the defacto, preferred ad server of choice for 90% of publishers. […]In a world where (nearly) everything that currently happens in DFP today can be executed via RTB pipes, ad exchanges/SSPs really truly can replace the ad server […] By invalidating the need for an ad server we are setting the stage for Google to actually have to compete alongside the SSPs (or whatever these platforms are called then) for any access to any publisher inventory in the future. And we'll be disadvantaged at that point because, unlike our competitors, pubs have been viewing us as a necessary evil, instead of a responsive, innovative partner, so they are eager to figure out how to cut us out altogether. […] We need to preserve the importance of the ad server […]").

[557] See Section VII.B for a discussion of how Google protected its market power in the ad exchange market.

[558] GOOG-AT-MDL-013083978 at -988. "Header Bidding Double-Header Strat Review" (January 22, 2019). Internal Google presentation describing the future of client-side indirect demand in Ad Manager. ("Why address this now? -Universal Pricing Rules + First-Price Auction equalizes access for AdX and Open Bidders -But, it also lets pubs set floors based on HB line item prices. -Limits insight into header bidding if more logic moves client-side -Loss of control over auction rules, access to inventory -Sets publishers up to mediate us altogether"); *See also,* GOOG-TEX-00093865 at -868. "Re: rough new outline proposal for "Jedi++' presentation" (October 24, 2016). Internal email thread with [redacted], [redacted], [redacted], [redacted],

448. Header Bidding weakened Google's advantages on the buy side and the sell side and undermined the heart of the "own-the-tag" strategy.[559] Google feared that with Header Bidding, publishers could connect with non-Google exchanges before DFP, receive the bid request triggered by the Header Bidding ad tags on the page, and consequently provide preferential access to rival demand sources and potentially bypass DFP's decisioning logic altogether. A 2016 email from [redacted] explains that networks like Criteo and Amazon would "probably leave AdX entirely if they could get all [of DFP's] inventory through HB."[560] A 2019 Header Bidding review document stated, "Header Bidding presents numerous problems" to Google, in particular to DFP, due to the "loss of tagging control" and the "possibility that SSPs won't call Ad Manager."[561] In response, Google decided to tie AdX and DFP and seal its publisher ad server monopoly contractually.[562] By contractually tying AdX and DFP, Google could protect DFP's inventory access and maintain control of demand routing logic.

C. Google's contractual tie foreclosed rival ad servers and harmed competition in the publisher ad server market

449. The foreclosure impact of the tie is evident from the changes in DFP market share. The effect of the contractual tie disadvantaged rivals of DFP because they no longer had access to AdX, which had unique Google Ads demand.[563] By foreclosing ad servers from access to AdX, Google harmed the viability of these rivals. Google decreased publishers' expected payout from using those rivals, reducing rivals' attractiveness compared to DFP.[564]

[redacted]. (Presentation outline includes slide to "Establish threat of HB: "Nightmare scenario" -We lose control over inventory access and ad selection when HB develops into server side wrappers than are a DFP replacement")

[559] GOOG-TEX-00089405 at -410. Untitled (January 11, 2016, *per metadata*). Internal Google document describing AwBid Summary Storyline. ("DFP and Google's "own the tag" strategy are at risk."; "Our own the tag strategy is also being challenged by Header Bidding")

[560] GOOG-TEX-00119904 at -905. "Re: Header bidding wrapper" (September 5, 2016). Internal email thread with [redacted] and [redacted].

[561] GOOG-AT-MDL-013083978 at -984. "Header Bidding Double-Header Strat Review" (January 22, 2019). Internal Google presentation describing the future of client-side indirect demand in Ad Manager.

[562] GOOG-TEX-00094574 at -577. "Re: Sell-side 2.0 VP review -- draft deck, would like to share more broadly on Mon" (March 15, 2017). Internal email thread with [redacted], [redacted], Nitish Korula, [redacted], [redacted], [redacted] and others. ("Thus, our strategy is to ensure that we continue to be the must-call system, by ensuring as much of a publisher's demand flows through our platform, rather than header bidding. Pillars of this strategy: 1 – Finish unification of DFP & AdX into one product.")

[563] Deposition of [redacted]

[564] Deposition of [redacted]

450. Before its acquisition by Google, DFP's market share was less than [redacted] in revenue terms.[565] A Google strategy presentation on Monetization suggests that DFP's US market share in 2011 was around [redacted].[566]

451. Google's internal strategy documents provide estimates of Google's DFP market share in later years. Internal documents evaluate DFP's market share information in terms of the proportion of domains with at least one DFP tag (breadth) and in terms of the proportion of available impressions that are DFP impressions (depth).[567] [redacted].[568] [redacted].[569] [redacted][570] These snapshots of DFP's share over time indicate that Google captured almost all of the ad server market in the few years following the AdX-DFP tie in 2016.

452. The contractual tie increased barriers to entry. The competitive landscape in the ad server market over the past 16 years since Google acquired DFP has also changed. During that time, as Google increased its market share, many of Google's competitors exited the market altogether. Notable exits include the open-source ad server OpenRamp, which shut down in 2013;[571] Facebook's Atlas that was shut down in 2016;[572] Conversant (formerly known as ValueClick) was shut down in 2019; [573] Verizon's

---

[565] Evans, David. "The Economics of the Online Advertising Industry." *Review of Network Economics*. vol. 7. no. 3. 2008. DoubleClick had at most [redacted] market share and faced competition from 24/7 Real Media, with [redacted] market share, and Atlas, with [redacted] market share. The shares are calculated from firms' total revenue. Note that the revenue figures for DoubleClick and 24/7 RealMedia are for the respective companies' entire revenue, including but not necessarily restricted to revenue from the provision of software tools.
[566] GOOG-NE-00133272 at -300. "Media and Platform Metrics: Monetization discussion" (May 24, 2011). Internal Google presentation on Google's sell-side and buy-side business plan.
[567] GOOG-AT-MDL-013871935 at -957. "Business Forecast Meeting Sell-Side" (December 10, 2018). Internal Google presentation on sell-side performance. (The document explains that Breadth is "# domains with DFP tag / # domains addr. running ads" and Depth is "# DFP impressions / # total estim. impressions domain addr. running ads")
[568] [redacted]
[569] [redacted]
[570] [redacted]
[571] AdExchanger. "OpenX Confirms 'Lights Out' For OnRamp Ad Server" (February 12, 2013). Accessed on May 10, 2024. https://www.adexchanger.com/online-advertising/openx-confirms-lights-out-for-onramp-ad-server/. ("In an update this morning, OpenX makes clear that OnRamp will never serve another ad.")
[572] AdExchanger. "Facebook Shutters Atlas Ad Server, Ending Its Assault On DoubleClick; Atlas To Live On As Measurement Pixel" (November 18, 2016). Accessed on May 10, 2024. https://www.adexchanger.com/platforms/facebook-shutters-atlas-ad-server-ending-assault-doubleclick-atlas-live-measurement-pixel/ ("On Friday, Facebook made the inevitable official by retiring the ad-serving component of Atlas,thereby making it primarily a people-based measurement pixel.").
[573] AdExchanger. "Alliance Data Buys Epsilon a $2.3B Present: Conversant" (September 11, 2014). Accessed on June 1, 2024. ("Conversant (formerly known as ValueClick/Dotomi) will be folded into Alliance's marketing services division Epsilon."); *See also,* AdButler. "AdButler is your best Conversant alternative." (undated). Accessed on May 10, 2024.

Oath (which was built from AOL's ad server AdTech and Yahoo's ad server Gemini) that closed in 2020,[574] and Sizmek, which, after declaring bankruptcy and being acquired by Amazon in 2019, will be shut down in 2024.[575]

453. In response to comments in 2019 referring to Google "tying DFP to Adx to Adwords to pubs," [redacted]."[576] [redacted][577] and thus, [redacted][578]

454. Figure 12 below depicts the trend over time for AdX gross revenue originating from DFP (GPT Tag) versus from third-party ad servers (AdX Direct Tag). The graph displays a clear trend of declining use of AdX direct tags. This means that over time, less AdX revenue has come from outside of Google's publisher ad server. Importantly, these results indicate that AdX tags were a relatively popular technology in 2014 and the existence of demand for Google's ad exchange (AdX) separately from ad serving (DFP) demand.

---

https://www.adbutler.com/conversant-alternative/. ("Conversant Ad Server is shutting down in mid 2019, and thousands of publishers are looking for an easy replacement.")

[574] AdExchanger. "Verizon Media Shuts Down Its Ad Server; Legacy Brands Stave Off the DTCs" (March 6, 2019). Accessed on May 2, 2024). https://www.adexchanger.com/ad-exchange-news/wednesday-03062019/. (" Verizon Media will shutter the Oath ad server in 2020, Adweek reports.").

[575] AdExchanger. " Amazon To Acquire Sizmek Ad Server And DCO Business" (May 31, 2019). Accessed on June 1, 2024. https://www.adexchanger.com/online-advertising/amazon-to-acquire-sizmek-ad-server-and-dco-business/. ("Amazon announced on Friday that it will buy Sizmek's ad server business and dynamic content optimization (DCO) solution, following a two-month sales review since Sizmek declared bankruptcy in March."); See also, Business Insider. "Amazon's decision to shutter its ad server next year is a major win for Google" (October 6, 2023). Accessed on June 1, 2024. https://www.businessinsider.com/amazon-shuttering-sizmek-ad-server-google-win-2023-10. ("Amazon this week said it will shut down its ad serving business by the end of 2024.").

[576] Deposition of [redacted]

[577] Deposition of [redacted]

[578] Deposition of [redacted]

Figure 12

[redacted]

455. The decline of AdX Direct tag impressions accelerates after 2018. In 2016, Google combined AdX and DFP into a single contract.[580] In 2018, Google combined AdX and DFP into a single product, GAM. After 2019, gross revenue from AdX direct tags [redacted].

456. It is incumbent on any economist that analyzes a tying arrangement to consider potential procompetitive benefits from the tie. A typical defense offered for a tie is that joint control of the products allows better control of overall quality such as when parts are tied to service. In this case, I am not aware of any such benefits. In addition, ownership of complementary products can lead to lower prices if both products participate in competitive markets. That is also not the case here. If further benefits are suggested by Google, I plan to evaluate such claims.

---

579 [redacted]

580 GOOG-DOJ-AT -01128809 at -823. "DRX* Contracting Guide" (undated). External Google PowerPoint on DFP and AdX contracts. ("The unified DFP/AdX Contract is the default contract (since June 2016) for both DFP (SB or Premium) and AdX. It is sometimes referred to as a DRX Contract.")

457. To conclude, Google's tie relied upon Google's market power in the ad exchange market (tying market) and harmed competition in the ad server market (tied market). It is important to note that the follow-on effect of both expanding Google's monopoly power in publisher ad-servers and the ways that Google steered publisher's towards AdX (some of which will be documented in later conduct below) contributed to a "virtuous cycle" in favor of Google's own ad tech stack. This enforced limitation by Google also increased AdX's market power, since publishers seeking to sell inventory to those advertisers must use AdX.

VII. GOOGLE STEERED INVENTORY TOWARDS ITS EXCHANGE AND DEPRIVED RIVAL EXCHANGES OF SUPPLY

458. Google engaged in a lot of conduct to maintain its monopoly power across the AdTech stack. In the following sections, I analyze four ways in which Google used its ad server monopoly to restrict publishers' choice and ability to monetize their ad inventory. For each, I demonstrate that Google was motivated by anticompetitive intent, and I explain why these changes constrained rival products and limited competition. First, I show that Google launched Unified Pricing Rules to constrain publishers' ability to choose third-party exchanges freely. Second, I show how Google's specific implementation of Dynamic Allocation was designed to subvert competition between exchanges; competition that publishers wanted and tried, alternatively, to implement through costly means such as Header Bidding. Third, I explain how Google constrained the competitive threat from Header Bidding by limiting the number of line items that publishers could set in the publisher ad server to manage demand sources. Fourth, I show that data redaction in data transfer files artificially made it more difficult for publishers to compete with rival exchanges. In each case, I establish that if Google had not had market power in the publisher ad server market and had not been vertically integrated from that market into an adjacent vertical segment (the exchange market), it would have neither had the ability nor the incentive to engage in the conduct described.

A. Google introduced Unified Pricing Rules to increase transactions on AdX, reduce competitive pressure from rival exchanges, and expand and maintain its monopoly power in the exchange market

459. The first way in which Google anticompetitively restricted the operation of ad servers was by implementing Unified Pricing Rules (UPR). In this section, I describe the nature and competitive impact of Google's UPR. I first explain, as relevant context, the economics of reserve prices in auction markets and how they benefit sellers.

1) The economics of reserve prices, as an essential revenue maximization tool used by sellers participating in auctions

460. Reserve prices are the minimum price that sellers are willing to accept for their product. Reserve prices are a common feature of auctions.[581] As such, the rules surrounding reserve prices are essential factors in auction design.[582]

461. Reserve prices are chosen by sellers who vary these floors depending on what items and when they are selling in an auction.[583] If the reserve price is not met, then no advertisement is shown. Rather than sell inventory at a price below their reserve price, sellers would prefer to show no ad. While this might forego short-term revenues or profits, this can help to achieve higher profitability and revenues over time. In other words, by adjusting reserve prices, the seller's long-term revenue can be maximized.[584] Thus, sellers value flexibility in terms of being able to adjust reserve prices.

462. To understand how a publisher seller might use reserve prices to maximize revenue, consider a straightforward setting. Suppose that there are two buyers for an advertising slot. One buyer values the slot at $2, and another values it at $1. Regardless of whether the slot is allocated according to an auction or by some other means, the economically efficient outcome would be to allocate that slot to the highest-value advertiser.[585] An appropriately designed auction can achieve that efficient outcome even if the seller does not know each buyer's value. As I explained in the introduction section, a common auction format in online advertising is the "second price auction. In this form of auction, buyers provide a bid, and the winner is determined by the highest bid, but the winner is only required to pay the price of the second-highest bid. In our example here, it is optimal for each buyer to bid their value -- $2 and $1 – respectively. This would result in the highest-value buyer winning the slot for a payment to the seller of $1.[586] If the seller were to set a reserve price of more than $1 (but less than $2), then the winner (who bid $2) would

---

[581] Examples of auctions include house auctions, timber auctions, eBay online auctions and auctions for online advertising inventory. For respective references, *see* McAfee, R. Preston, Daniel C. Quan, and Daniel R. Vincent. "How to Set Minimum Acceptable Bids, with Application to Real Estate Auctions." Journal of Industrial Economics. 50, no. 4. 2002. Pg. 391–416; Paarsch, Harry J. "Deriving an Estimate of the Optimal Reserve Price: An Application to British Columbian Timber Sales." *Journal of Econometrics.* 78, no. 2. 1997. pg. 333–57; Ostrovsky, M. & Schwarz, M. Reserve Prices in Internet Advertising Auctions: A Field Experiment. *Journal of Political Economic.* 131. 2023. pg. 3352–3376.

[582] *See*, for instance, the Nobel prize winning work: Roger Myerson. "Optimal auction design." *Mathematics of Operations Research*. 6, no. 1. 1981. pg. 58–73.

[583] McAfee, R. Preston, and Daniel R. Vincent. "Updating the Reserve Price in Common Value Auctions." *American Economic Review*. 82, no. 2. 1992. pg. 512–18

[584] Reiley, David. "Field Experiments on the Effects of Reserve Prices in Auctions: More Magic on the Internet." *RAND Journal of Economics*. 37, no. 1. 2006. pg. 195–211.

[585] By efficient, I use the economics definition of maximizing surplus; that is, the difference between willingness to pay and willingness to sell.

[586] It is a well-known result that in private value auctions, it is optimal for each bidder to bid their value. *See* Vickrey, William. "Counterspeculation, Auctions, and Competitive Sealed Tenders." *The Journal of Finance*. 16, no. 1. 1961. pg. 8–37.

pay the seller's reserve price rather than $1. In setting that reserve, however, the seller risks not selling the item at all if none of the bidders are willing to pay more than that reserve.

463. Another possible auction design is a first-price auction where the winner is again determined by the highest bid, but the winning bidder pays their bid to the seller. In this case, the bidders face a tradeoff. A lower bid reduces the price the buyer pays if they win, but it also reduces their chances of winning. The more competition there is amongst bidders, the greater is the risk that a bid less than their full valuation will lose the auction, and this tends to raise bids in a first-price auction.[587] When there is relatively less competition amongst buyers, sellers can counter the bidder's incentives to shade their bid levels relative to their true valuations by setting a reservation price.

464. A key factor determining the optimal reserve price level is a seller's expectations of the possibility that there will be a high-value bidder amongst the pool of potential bidders. For instance, in advertising auctions, a publisher might realize that a particular advertiser type has a high valuation for advertising next to the publisher's content. In this case, the publisher would benefit from setting a correspondingly high reserve price. Similarly, if the publisher expects a selling channel to provide higher quality matches between their users and advertisers and, therefore, a higher willingness to pay from the advertiser, the publisher might raise the reservation price in order to receive a higher payment. Finally, as will be discussed shortly, a publisher may alter a reserve price if the fees that a particular auction or intermediary charges are different from those of other providers.

465. To summarize, reserve prices are an essential revenue maximization tool used by sellers participating in auctions. They are deployed actively in situations when competition amongst buyers is expected to be lower, when information on buyer willingness to pay is more freely available and when there are distinct characteristics of dealing through different channels. Hence, sellers highly value having the option to set such reserve prices flexibly.

a) Publishers value being able to set reserve price floors

466. Publisher ad servers are sell-side tools catering to publishers who are looking to optimize their advertising revenue. If the market for those sell-side tools is competitive, sell-side tools providers will offer publishers products that give them opportunities to achieve their advertising revenue goals. Specifically, a provider of sell-side tools in a competitive market will give sellers the option to set reserve

[587] Ostrovsky, Michael, and Andrzej Skrzypacz. "Pure-Strategy Equilibrium in the Generalized First-Price Auction." *Stanford University Graduate School of Business Research Paper No. 4250550*. 2022.

prices that can vary by buyer. Providers who do not offer publishers those options risk being outcompeted by those who do not.[588]

467. To illustrate the value of such flexibility, consider a publisher who uses sell-side tools to set reserve prices for different exchanges; for instance, the publisher might want a different floor for AdX than for Xandr based on the publisher's understanding of the relative willingness to pay of advertisers using AdX and advertisers using Xandr. The publisher expects that each can provide bidders, at least one of whom will value an ad at, say, \$2 and will pay \$2–x once the auction is run where here 'x' reflects the difference between the bid and second-highest bid. However, AdX charges a fee for matching the advertiser with the publisher comprising a share a1 of \$2-x while Xandr charges a2. Thus, for the publisher, if a1 does not equal a2, they have a preference for the channel with the lower fee. If the publisher does not set a reserve price for either, then they expect to receive (1-a1)(2-x) from AdX and (1-a2)(2-x) from Xandr. If a1 > a2, the publisher will, therefore, want to use Xandr rather than AdX, putting pressure on AdX to lower its fee.

468. Suppose, however, that the publisher can set different reserve prices for each channel. As described earlier, by raising its reserve price, a publisher can receive a higher payment from the highest bidder, but there is a risk of finding no buyer at all. Suppose that if the publisher sets a reserve of y, then there is a probability, P(y) < 1, that the auction will close. In this case, rather than just relying on one channel if there are different fees, the publisher can equalize their expected returns by setting a higher reserve price for the channel with the higher fee. Specifically, by setting y (<2 and > 2-x) such that the following equation holds, the publisher is indifferent between offering inventory on both channels.

$$P(y)(1-a1)y = (1-a2)(2-x)$$

469. Note that if a1 > a2, this can only happen if P(y)y > 2-x; that is, if setting a reserve price raises publisher revenue on AdX. Reserve prices are a more effective tool if there is more competition among bidders. Thus, this method of setting a reserve price to optimize revenue net of intermediary fees will likely only be viable if the higher fee is set by the channel with a greater number of advertisers.

[588] As already noted, sellers will value the ability to set reserve prices in auctions flexibly, as this allows them to capture a greater proportion of buyers' willingness to pay for their product. A sophisticated seller will learn to use reserve prices to maximize their revenue. Thus, the conclusion here is not that providers in a competitive sell-side market will offer only full flexibility or simplification but that they will provide options where users value them. As will be demonstrated below, many publishers valued being able to set reserve price floors using Google's sell-side products flexibly and were dissatisfied when those options stopped being provided.

470. Thus, providers in a competitive sell-side market will provide options ranging from full flexibility to simplification where users value them. Competitive publisher ad server providers will want to offer publishers the flexibility to set per-channel reserve prices if the fees charged by channels are different, the 'size' of each channel and the average quality of the buyers reached via each channel is different based on the number of buyers they are able to bring to the seller's auction. This allows publishers to multi-home across channels rather than having to choose one or the other if the channels are not equivalent competitors. As will be demonstrated below, many publishers valued being able to set reserve price floors using Google's sell-side products flexibly and were dissatisfied when those options were removed.

b) Monopoly power restricts publishers from switching to sell-side tool providers that offer flexible reserve price options

471. A sell-side tool provider might be vertically integrated into an exchange. This, however, does not change the conclusion above that the provider will provide flexible options to sellers as long as the sell-side tool provider market is competitive. In this case, if the integrated sell-side tool provider does not provide reserve price flexibility and their exchange offers more buyers than rivals, then the publisher will have an incentive to switch to a sell-side tool provider that does provide that price flexibility.

472. If, however, the ad server market is not competitive, then publishers may not have other alternatives and will not be able to switch even if the dominant ad server does not provide reserve price flexibility. But even in this situation, we have to ask why the dominant sell-side tool provider would not provide reserve price flexibility to its users. After all, providing such flexibility allows the users to maximize revenue, which raises publisher demand from the ad server and, thus, the prices that the dominant provider can charge.

473. The combination of vertical integration and market power held by the provider in the sell-side tools market gives a provider both the ability and the incentive to remove reserve price flexibility. Suppose that provider requires that users of its sell-side tools set the same reserve price across channels. In that case, publishers will not have the ability to counter any difference in fees or other differences (say, in information about users that change the quality of matches) to maximize their own revenue. In terms of the earlier example, moving from a situation where reserve price flexibility was allowed to one where the dominant (and integrated) sell-side tool provider removed that flexibility, a publisher will be forced to either lower its reserve price on the integrated channel or raise its reserve price on other channels or both. This will cause more auctions to be completed on the integrated channel and fewer to be completed on other channels without the integrated provider having to reduce their fees. By removing the constraint on exchange fees that could be applied with flexible reserve pricing, transactions are steered towards the

integrated provider's own stack. Hence, an integrated provider with market power in sell-side tools has the incentive to remove the option to set reserve prices based on channels, even when they allow flexible reserve prices in other dimensions.

474. The notion that monopoly power can give rise to conditions that constrain customers' behavior with respect to non-integrated rivals has a long history in economics.[589] This type of steering is commonly explored in the literature examining vertically integrated firms with market power and also in a newer literature that has focused on contracts that reference rivals.[590]

2) Functioning of UPR

475. Having illustrated the economics of reserve pricing, and provider incentives with respect to providing flexibility in setting reserve prices, in this section I explain the nature of Google's UPR.

476. The ability to set pricing floors is a functionality for publishers provided by a publisher tool. In programmatic advertising, price floors are generally set via a publisher ad server or directly with an exchange or SSP partner.[591] UPR is imposed by Google's ad server and not by Google's exchange or buying tools. Thus, UPR interferes with publishers' ability to optimize their inventory's yield using the tool that exists for this purpose (i.e. the publisher ad server). UPR involved the following restrictions on the options available to publishers in Google's ad server:

- Publishers could no longer set per-buyer tool floors[592] (i.e., different floors for ad buying tools on AdX) or AdX floors ("AdX Pricing Rules"). Before UPR, AdX floors could differ from the floors publishers set for other exchanges outside of DFP.[593] After UPR, the demand sources outside of AdX (exchanges and buying tools bidding through exchanges)

[589] See Rey, Patrick, and Jean Tirole. "A primer on foreclosure." *Handbook of industrial organization* 3 (2007): 2145-2220; Ordover, Janusz A., Garth Saloner, and Steven C. Salop. "Equilibrium vertical foreclosure." *The American Economic Review* (1990): 127-142; Hart, Oliver, Jean Tirole, Dennis W. Carlton, and Oliver E. Williamson. "Vertical integration and market foreclosure." *Brookings papers on economic activity. Microeconomics* 1990 (1990): 205-286; and de Fontenay, Catherine C., and Joshua S. Gans. "Vertical integration in the presence of upstream competition." *RAND Journal of Economics* (2005): 544-572.

[590] Morton, Fiona M. Scott. "Contracts that reference rivals." *Antitrust*. 27, no. 3. 2013; Liu, Fan, David S. Sibley, and Wei Zhao. "Vertical Contracts That Reference Rivals." *Review of Industrial Organization.* 56, no. 2. 2020. pg. 381-407.

[591] For Header Bidding, price floors can also be optimized at the wrapper level. *See* HeaderBidding. "Price Floor Optimization – A Guide for Publishers." (April 17, 2024). Accessed on June 1, 2024. https://headerbidding.co/price-floor-optimization/ ("Since publishers serve ads via ad server and work with several demand partners at the same time, the price floor can be optimized at the ad server level (for AdX), and at the wrapper level (for header bidding partners).").

[592] GOOG-AT-MDL-000875073 at -083. "The Unified First Price Auction" (August 2019). External Google PowerPoint to communicate Unified First Price Auction changes with publishers. Slide 083 shows that under "AdX Open Auction Pricing Rule", publishers could set "per-buyer floor"; whereas under UPR, they could not.

[593] Exchange Bidding, Network Bidding and remnant bids were exempt from AdX Pricing Rules. *See* GOOG-NE-03995243 at -243. "PRD: Unified 1P auction and Pricing rules" (July 25, 2018). Internal Google document on UPR with input from Nitish Korula, [redacted], and others. ("AdX Pricing rules, allows publishers to set reserve prices on AdX bids, but EB, NB, and remnant bids are exempt from these floors.")

have to conform to the same ad server pricing rules as AdX. Floors across channels (i.e., across Google's exchange and other exchanges through Exchange Bidding (also known as Open Bidding),[594] remnant line items, and ad buying tools bidding via AdX and Exchange Bidding) are thus uniform after UPR.[595] Per advertiser floors (e.g., floors for particular advertisers but not floors for a buying tool)[596] could still be set.

- Publishers were limited to 200 rules (per-advertiser floors).[597] This was a reduction from a previous limit of 5,000 floors[598] that was exercised by large publishers who typically used "hundreds upon hundreds of rules for different buyers, including Google."[599]

477. In a 2020 presentation, Google explained that UPR applies to all indirect demand.[600] This includes all non-guaranteed such as network/exchange, bulk, price priority, Authorized Buyers, [601] Open Bidding, and Header Bidding.

478. For this reason, the UPR floor also applies to Header Bidding in that the Header Bidding winner has to clear the unified floor to transact the impression. However, UPR cannot apply to the Header

[594] Open Bidding and Exchange Bidding refer to the same Google ad server product. I use these two terms interchangeably throughout the report.
[595] GOOG-AT-MDL-000875073 at -083. "The Unified First Price Auction" (August 2019). External Google PowerPoint to communicate Unified First Price Auction changes with publishers. Slide 083 shows that under UPR, "floor applies to authorized buyers (Ad Exchange), Exchanges on EBDA, Non-guaranteed line items (excluding $0 non-guaranteed and House)."
[596] Google Ad manager Help. "Unified pricing rules" (undated). Accessed June 1, 2024. https://support.google.com/admanager/answer/9298008?hl=en ("However, you can optionally specify pricing for individual advertisers […]").
[597] This increased from the initial 100 rules after Google received backlash from publishers. *See* Australian Competition Consumer Commission. "Digital advertising services inquiry. Final report." pg. 85. (August 2021). https://www.accc.gov.au/system/files/News%20Corp%20Australia%20%2815%20May%202020%29.pdf ("It also limits the number of rules a publisher can use when selling inventory to 200, which is significant because publishers could previously set up to 5000 rules."); AdExchanger. "Publishers Lash Out Against Google Over 'Unified Pricing' Changes" (April 18, 2019). Accessed on May 31, 2024. https://www.adexchanger.com/online-advertising/publishers-lash-out-against-google-over-unified-pricing-changes/ ("Google held a meeting Thursday with its top publisher partners to discuss numerous new product changes, collectively called "unified pricing," that could upend publisher strategy and leave them with less control over their ad inventory. It soon got heated.")
[598] Australian Competition Consumer Commission. "Digital advertising services inquiry. Final report." pg. 85. (August 2021). https://www.accc.gov.au/system/files/News%20Corp%20Australia%20%2815%20May%202020%29.pdf ("It also limits the number of rules a publisher can use when selling inventory to 200, which is significant because publishers could previously set up to 5000 rules.").
[599] Digiday. "It's a shakedown': Everything you need to know about Google's 'unified pricing' product changes" (April 25, 2019). Accessed on May 31, 2024. https://digiday.com/media/shakedown-everything-need-know-googles-unified-pricing-product-changes/ ("One change caps the number of rules a publisher can set for its floor prices at 100. Large publishers typically use hundreds upon hundreds of rules for different buyers, including Google. In restricting publisher control of that, it enhances Google's, publisher sources claim.").
[600] GOOG-AT-MDL-001793318 at -344. "RTB Insights". (undated). External Google PowerPoint on the programmatic ecosystem. ("Unified floor across all indirect demand.").
[601] GOOG-AT-MDL-001004706 at -728. "Ad Manager Ecosystem 101" (June 2019). Internal Google presentation introducing the ads ecosystem by gTech. ("The buyer facing side of Google Ad Exchange is called Authorized Buyers and different DSPs can connect to it using our proprietary Real Time Bidding protocol or an industry standard OpenRTB.").

Bidding auction itself – as a Google source explains that "HB doesn't go through our system and their bid runs before our auction does."[602]

479. By restricting publishers' choice of transaction channel on a per-impression basis with the use of different floors per channel (i.e., ad exchanges and ad buying tools), UPR prevented publishers from maximizing yield across channels. This contrasts with Header Bidding, which allows publishers to set different price floors for different channels.[603]

3) Google imposed UPR in order to harm competition in the exchange market

480. In this section, I analyze Google's intent in imposing UPR on publishers. This is relevant since Google's intent indicates Google's expectation of the likely outcome. I find that Google's intent with UPR was to increase transactions on AdX and reduce competitive pressure from rival exchanges. Moreover, Google tried to hide its anticompetitive motives. Google publicly presented UPR as a positive innovation that would benefit publishers and used an unrelated change in auction format as a justification. However, internal communications and analysis make clear the change was meant to harm competition and would likely harm publishers as well.

481. The launch of UPR[604] occurred simultaneously with a change to a first-price auction for Google's exchange with the name "Unified first price auction," announced in March of 2019.[605] Google employees thought that just implementing UPR would seem "self serving."[606] An internal Google document lists the primary motivations for moving from a second- to a first-price auction format, the first being "AdX clearing price not always being competitive in the unified auction," making it clear that the ability to obfuscate the UPR change was one of the main appeals of the first-price format change.[607] In reality, there is no link between unified floors and moving to a first price auction. Thus, the change to first-price auction was used as a justification for UPR.

---

[602] GOOG-AT-MDL-006030180 at -1166. "Exchange Platform Sales" (July 9, 2020). Internal Google PowerPoint on weekly exchange performance.
[603] HeaderBidding. "Price Floor Optimization – A Guide for Publishers." (April 17, 2024). Accessed on June 1, 2024. https://headerbidding.co/price-floor-optimization/; Sovrn. "The Past, Present, and Future of Header Bidding" (February 21, 2017). Accessed on June 1, 2024. https://www.sovrn.com/blog/header-bidding-grows-up/
[604] Google's First Am. Resps. and Objs. to Plaintiff's Third Set of Interrogs. (May 24, 2024) at 12.
[605] Google Ad Manager. "Simplifying programmatic: first price auctions for Google Ad Manager" (March 6, 2019). Accessed on June 1, 2024. https://blog.google/products/admanager/simplifying-programmatic-first-price-auctions-google-ad-manager/?_gl=1*1nsygc7*_ga*OTUwMjc3MzU5LjE2OTQ2MzMzMDc.*_ga_KDB2CE5G3Y*MTY5OTk4ODgxOS44LjAuMTY5OTk4ODgyMC4wLjAuMA ("In order to help simplify programmatic for our partners, in the coming months we'll start to transition publisher inventory to a unified first price auction for Google Ad Manager.").
[606] GOOG-DOJ-AT -00569648 at -648. "Fwd: Frist-price & Removing pricing knobs" (May 11, 2019). Internal email thread with [redacted] and Nirmal Jayaram. ("Doing this [UPR] by itself makes it look extremely self serving.").
[607] GOOG-TEX-00841386 at -388. "AdX First Price Auction" (October 28, 2010). Internal Google document on Google's motivation for UPR.

482. Under UPR with a first-price auction, the same price floor is applied to all submitted bids coming from AdX (CAT2, DBM, RTB) and from non-AdX exchanges (Jedi).[608] Only mediation (in-app ads) and direct deals are not under the unified floor constraint[609] (the different treatment of which further show why such inventory is not in the relevant markets). All bids then compete in a first-price auction to determine the winning bid.[610]

483. Google justified UPR to publishers by claiming that price-discriminating floors are not useful given the move to a first-price auction.[611] This is not the case. At the same time, Google acknowledged in internal documents the real motivation – that UPR would lead to AdX clearing more impressions.[612]

484. Google's internal studies and documents show that the primary motive behind introducing UPR was to limit publishers' returns to listing inventory on multiple exchanges. Google's internal studies found that publishers listed inventory on multiple exchanges and tended to set higher floors on AdX compared to other exchanges.[613] Internal Google documentation also shows that as a result of higher AdX floors, majority of impressions sold through Header Bidding were often sold at a price below the floor for AdX.[614] This scenario led Google to claim that unified floors made the market more efficient due to the possibility of a higher bid being excluded because of different floor levels (e.g. the highest bid on AdX could be higher than the highest bid on another exchange, but the highest bid on AdX could be excluded due to higher AdX price floors).[615] However, as I discuss in Section VII.A.1, differential floors allowed publishers to more effectively monetize their inventory and UPR restricted publisher choice of channels.

---

608 GOOG-TEX-00841386 at -393. "AdX First Price Auction" (October 28, 2010). Internal Google document on Google's motivation for UPR.
609 GOOG-TEX-00841386 at -393. "AdX First Price Auction" (October 28, 2010). Internal Google document on Google's motivation for UPR.
610 GOOG-TEX-00841386 at -393. "AdX First Price Auction" (October 28, 2010). Internal Google document on Google's motivation for UPR.
611 GOOG-TEX-00595459 at -460. "Unified First Price Auction - Best Practices" (August 20, 2019). Internal Google document on UPR. ("In a first price auction buyers pay what they bid, therefore floor prices no longer serve the purpose of closing the gap between the highest bid and the second bid.").
612 *See* for e.g., GOOG-TEX-00842875 at -905. "Changes to Ad Manager, Ad Mob Auction" (September 3, 2019). Internal Google PowerPoint on GAM web inventory. ("Estimated [redacted] in value of impressions won by AdX, that are currently blocked due to high legacy floors"); GOOG-AT-MDL-008014086 at -100. "State of the Ads Ecosystem" (October 30, 2019). Internal Google PowerPoint on AdManager, AdSense and AdMob. The presentation shows that AdX matched queries and impressions both [redacted] one month after the launch.
613 GOOG-NE-07953883 at -913. "Repricing + 1P Auctions GTM Leads Review" (December 2018). Internal Google PowerPoint on first-price auction. ("Pubs list inventory on multiple SSPs, and floors tend to be higher on AdX.")
614 GOOG-NE-07953883 at -913. "Repricing + 1P Auctions GTM Leads Review" (December 2018). Internal Google PowerPoint on first-price auction. [redacted]"); GOOG-TEX-00096998 at -998. "AdX Fair Competition Against Header Bidding when Header Bidding is the Winning Line Item" (May 2018). Internal Google document on Header Bidding and line items. ([redacted]").
615 GOOG-AT-MDL-000875073 at -080. "The Unified First Price Auction" (August 2019). External Google PowerPoint to communicate Unified First Price Auction changes with publishers. ("Unified 1P auction enables a more efficient market…[…] highest eligible net bid wins.").

485. One of Google's goals with UPR was to curb Header Bidding adoption. In a 2018 document, Google explained that there is little they can do to stop Header Bidding adoption.[616] Thus, Google focused on "incentiviz[ing] pubs to only use HB for truly incremental demand."[617] Another 2018 email acknowledges that the roll-out of the first-price auction would weaken Header Bidding, stating "we get the move to IP done which will make HB much less valuable."[618]

486. In response to the question of why Exchange Bidding did not stop Header Bidding's growth, a Google internal presentation devised strategies against Header Bidding and stated that "Pubs are seeking some revenue diversity from Google" and "Different floors [are] applied to EB vs HB."[619] In a similar context, a Google employee commented that "the differential floors should hopefully be solved when we move to 1st price and unify floors across adx, EB, and remnant in the process (understanding pubs will likely find some way to game this)"[620] This shows Google's awareness that UPR would limit the growth and use of Header Bidding.

487. Google's intent with UPR was to have publishers lower the price floors they set on AdX,[621] so that more transactions would flow through AdX, albeit at the expense of publisher yields.[622] Google aimed to conceal this intent to publishers by not sharing insights that higher floors could lead to more revenue. A 2020 strategy document discussed the implementation of a "floor price simulator" feature.[623]

---

[616] GOOG-AT-MDL-008947559 at -559. (May 21, 2018). Internal Google document on Header Bidding adoption. ("There is very little we as DRX can do to stop HB adoption, since sophisticated publishers that are hungry for yield will continue using HB as long as there is incremental dollars to be made.").
[617] GOOG-AT-MDL-008947559 at -559. (May 21, 2018). Internal Google document on Header Bidding adoption. ("Our focus is on making HB a more tolerable solution; In other words: […] incentivize pubs to only use HB for truly incremental demand.").
[618] GOOG-TEX-00090969 at -969. "Re: Ultraprio - Increase the ALI for Turner" (September 26, 2018). Internal email thread with [redacted], [redacted], [redacted], [redacted], and others.
[619] GOOG-NE-10293244 at -252. "Header Bidding Double-Header Strat Review" (January 22, 2019). Internal Google PowerPoint on Header Bidding and Exchange Bidding.
[620] GOOG-TEX-00967585 at -596. (January 22, 2019). Internal Google PowerPoint on the Header Bidding threat.
[621] GOOG-TEX-00841386 at -388. "AdX First Price Auction" (October 28, 2010). Internal Google document on Google's motivation for UPR. ("AdX clearing price not always being competitive in the unified auction.")
[622] GOOG-DOJ-AT -00569648 at -648. "Fwd: Frist-price & Removing pricing knobs" (May 11, 2019). Internal email thread with [redacted] and Nirmal Jayaram. ("The presence of per demand floors really hurts us and has been one of the biggest challenges for AdX as a platform vs some of the other exchanges"; "I think most pubs like a dollar from other buyers or from Google equally. They just want to maximize overall yield. As soon as this incentive disappears by moving to first-price then per-buyer floor application will be limited to cases that pubs prefer a dollar from others over a dollar from us. I do not like hearing that our dollar is less valuable than others and I like to fix it. However, I am worried that by bundling these two issues 1) Google is subject to higher floor prices because I make more money this way; 2) Google is subject to higher floor prices because I prefer others; we end up solving non[e] of them or at least delay solving the first one.").
[623] GOOG-AT-MDL-000990499 at -499. "PRD: Bid Insights - Auction Simulator" (January 24, 2020). Internal Google PowerPoint on the bid insights card that shows the distribution of bids for various pricing rules.

Google claimed that this feature would enable publishers to see how varying floor prices on a given UPR would have impacted their overall yield.[624]

488. However, it is clear that Google's intent was to induce publishers to believe that lower floors would benefit them. In the same document, Google considered concealing the impact of bid shading to incentivize publishers to lower their floors.[625] Indeed, Google noted that a graph representing bid shading would look like an inverted U.

Figure 13

2020 Google strategy document showing the correlation between floors and revenue for publishers when taking into account bid shading[626]

489. The document then describes ways Google usually "deals with" bid shading, including ignoring that it happens, or intentionally depicting an untruthful picture to publishers to serve its best interest of lowering floors on AdX.[627]

---

[624] GOOG-AT-MDL-000990499 at -499. "PRD: Bid Insights - Auction Simulator" (January 24, 2020). Internal Google PowerPoint on the bid insights card that shows the distribution of bids for various pricing rules. ("Publishers can use this card to understand if their floor prices are set appropriately and how it impacts their yield.").

[625] GOOG-AT-MDL-000990499 at -503. "PRD: Bid Insights - Auction Simulator" (January 24, 2020). Internal Google PowerPoint on the bid insights card that shows the distribution of bids for various pricing rules. ("Preliminary results from the Drx Quality team show that there is a significant [redacted] amount of bid shading performed by some buyers as publishers lower their floor prices. If we ignore this effect, then the potential revenue gains our model would show as publishers lower their floor prices would overstate their revenue significantly (since in reality buyers will lower their bids). […] However, if we do this [i.e., include bid shading in the model] it's possible that some of our results will show publishers that raising their floor prices would increase their revenue, which is undesirable for multiple reasons.")

[626] GOOG-AT-MDL-000990499 at -505. "PRD: Bid Insights - Auction Simulator" (January 24, 2020). Internal Google PowerPoint on the bid insights card that shows the distribution of bids for various pricing rules.

[627] GOOG-AT-MDL-000990499 at -505. "PRD: Bid Insights - Auction Simulator" (January 24, 2020). Internal Google PowerPoint on the bid insights card that shows the distribution of bids for various pricing rules. (The document explains that "in

4) UPR harmed competition in the exchange market

490. In this section, I explain the competitive harm that Google's UPR strategy had on the exchange market. Specifically, I find that UPR gave AdX an advantage over rivals at the expense of publisher choice and ability to effectively monetize their inventory, and UPR led to more transactions through Google's ad-buying tools and exchanges at the expense of third parties.

a) UPR lowered floors on AdX

491. In this section, I analyze internal Google documents demonstrating how UPR dramatically lowered price floors on AdX.

492. Internal Google documents show how UPR impacted the price floors set by publishers. An internal presentation from September 2019 on the multiple changes that are happening in the Google ad tech stack includes a summary of the effect of UPR on price floors.[628] The presentation emphasizes that UPR led to "material reduction in effective floors" and states that new universal price rules set by the publishers are approximately [redacted] of what they were before the implementation of UPR.[629] Notably, it states that, for AdWords, the average publisher floor reduced from [redacted] after the implementation of UPR, leading to more than [redacted].[630]

493. Another internal Google presentation from December 2020 (Figure 14) on the sell-side auction quality optimizations provides a plot of the average floor for the U.S. matched queries for the months preceding and following the implementation of UPR.[631] The plot shows the average floor in terms of

general, [Google has] the following options to deal with bid shading buyers: Ignore that it happens. Run simulations without incorporating any bid shading model, results will be that a lower reserve price always results in higher revenue. Downside is that the revenue for low reserve prices will be greatly overstated; Use the quality team's model, incorporating a model of how buyers change their bids as publishers lower or raise their prices, show whatever we get. This is the most accurate we know how to generate, but it will show graphs where we show higher revenue if the publisher raises their reserve prices, which we don't want. […]; Not make the chart available for every subrule. Surface it as an insight card when we think it's appropriate the way we do with other insights. In this case we can generate the data as in option 2, but not surface it to publishers if it suggests raising the reserve price would be beneficial. […]" The document concludes: "One proposal coming out of this discussion is to only show this graph only on opportunities where we suggest publishers lower their floors.")

[628] GOOG-AT-MDL-001977826 at -855. "Changes to Ad Manager, AdMob auction" (September 3, 2019). Internal Google PowerPoint on Ad Manager web inventory.

[629] [redacted].

[630] [redacted].

[631] GOOG-DOJ-AT -01516187 at -188. "Sellside auction quality optimizations" (December 9, 2020). Internal Google PowerPoint on auction floors, RPO, Optimized Pricing Rules, and DRS.

CPM going from around [redacted], a reduction of [redacted] as a result of the co-rollouts UPR and the first-price format change.[632]

Figure 14

[redacted]

494. The larger, more sophisticated publishers utilized UPR more than the smaller publishers.[634] This significant drop could have been due to Google's practice of defaulting the price floor to 0 when there

[632] [redacted].

[633] [redacted]

[634] As I explained, floor granularity was primarily implemented by large advertisers. *See* Digiday. "It's a shakedown': Everything you need to know about Google's 'unified pricing' product changes" (April 25, 2019). Accessed on May 31, 2024. https://digiday.com/media/shakedown-everything-need-know-googles-unified-pricing-product-changes/ ("One change caps the number of rules a publisher can set for its floor prices at 100. Large publishers typically use hundreds upon hundreds of rules for different buyers, including Google. In restricting publisher control of that, it enhances Google's, publisher sources claim.").

was no UPR set by a publisher[635] and to the fact that [redacted] of publishers did not set up any UPR floors by October 2019.[636] However, in terms of revenue volumes, [redacted] of AdX revenue at the time came from publishers who implemented at least one UPR.[637]

495. The same Google document states that, following the launches of the first-price auction format change and UPR, "[redacted]" and "fewer queries are falling in higher price floor buckets," which leads to lower floor prices on average.[638] Figure 15 depicts a graph of the price of floor bucket volumes from an internal Google document.

[635] GOOG-AT-MDL-000993753 at -754. (October 2019). Internal Google document on declaration in AdX revenue growth. ("If publishers don't set UPRs (defaults to $0).").

[636] [redacted]

[637] [redacted]

[638] [redacted]

Figure 15

[redacted]

496. These significant declines in publisher price floors translated into advantages for AdX over rival exchanges, as I demonstrate in the next section.

b) Google's ad exchange transacted more impressions because of UPR, harming rivals

497. UPR was extremely effective at reducing price floors set by publishers, as evidenced in the previous section. In this section, I analyze how these price reductions drove transaction volumes to Google's own products and harmed third-party rivals.

498. An internal Google presentation from September 2019 documenting the multiple changes that happened in the Google ad tech stack showed that UPR led to an "[redacted]."[640]

[639] GOOG-AT-MDL-000993753 at -756. (Untitled). (October 2019). Internal Google document on declaration in AdX revenue growth.

[640] [redacted]

499. Figure 16 graphically presents Google-produced sell-side data and shows monthly impressions through AdX, Header Bidding, Remnant DFP, and Open Bidding. Transactions through AdX started increasing in September 2019, one month after the 100% rollout of UPR.[641] During this time, however, AdX was also switched to a first-price auction, so I am not able to conclude that the effect seen in this analysis is due solely to the rollout of UPR. At the same time, Open Bidding, a method that allowed publishers to invite third-party demand partners to compete for real-time inventory through Dynamic Allocation,[642] declined in impressions transacted in the months following the rollout of UPR. Monthly impressions cleared by third parties in Open Bidding [redacted] from May to October 2019.

[641] GOOG-DOJ-AT -00593652 at -668. "The Unified Price Auction" (May 2019). Internal Google PowerPoint on UPR. ("Late July: All publisher traffic (100%) fall a first-price auction and only unified pricing rules apply. Open Auction rules no longer apply to any traffic.").
[642] GOOG-AT-MDL-001267098 at -100. "Onboard online with Open Bidding in Ad Manager" (Q3 2022). External PowerPoint on Open Bidding. ("Open Bidding allows publishers to invite third-party demand partners to compete for your inventory in dynamic allocation through a single auction with real-time, server-to-server bidding.")

Figure 16

[redacted]

643 [redacted].

5) UPR harmed competition in the market for ad buying tools for large advertisers

500. In this section, I provide evidence that Google's introduction of UPR (i) was also motivated by Google's intent to reduce floors and increase share for its ad buying tools and (ii) allowed Google's ad buying tool for large advertisers (DV360) to clear more impressions at the expense of competitors.

501. As stated by [redacted], Vice President of Engineering at Google, Google's buyside algorithms (e.g., Poirot and Bernanke) generated "huge bid variability" and "This has produced an opportunity for pubs to generate more revenue by per-buyer flooring and subjecting GDN and DBM to higher floors."[644] As such, Amini admitted that UPR was "an opportunity to significantly limit the ability of publishers to set floor-prices per buyers (which is a good goal to have)."[645] Similarly, [redacted], Product Manager for GAM, stated that "Pubs have had traditionally been deliberate about setting higher floors for AdX in general, and GDN/DBM in particular."[646]

502. Google documented the expected impact of UPR on the performance of ad buying tools for large advertisers.[647] In particular, the experiment conducted anticipated that UPR would improve Google's inventory access, leading to [redacted] in impressions won by DBM and an [redacted].

6) UPR harmed publishers by reducing the effectiveness of the monetization of their inventory

503. In this section, I provide evidence that publishers were substantially harmed by UPR. In particular, the rollout created significant confusion and reduced quality which was a far cry from the simplification that Google touted to publishers. I then provide evidence that publishers experienced lower prices after the co-rollout of UPR and the first-price auction transition. I also discuss how the loss should be attributed to UPR instead of the first-price auction transition and further explain that the negative

---

[644] GOOG-NE-02345024 at -024. "Re: First-price & Removing pricing knobs." (May 11, 2019). Internal email thread between [redacted], [redacted], [redacted]. ("GDN/UAC has huge bid variability because our ML based auto-bidding/pCTR systems demonstrate huge variability in query valuation which in second price auction is the same as bid variation. […] This has produced an opportunity for pubs to generate more revenue by per-buyer flooring and subjecting GDN and DBM to higher floors.").

[645] GOOG-NE-02345024 at -024. "Re: First-price & Removing pricing knobs." (May 11, 2019). Internal email thread between [redacted], [redacted], [redacted]. ("However, Adx team wanted to use this migration as an opportunity to significantly limit the ability of publishers to set floor-prices per buyers (which is good goal to have).").

[646] GOOG-DOJ-12948968 at -968. "Fwd: 1st Price Changes." (June 10, 2019). Internal email thread between [redacted], [redacted], [redacted].

[647] GOOG-AT-MDL-001977826 at -834. "Changes to Ad Manager, AdMob auction" (September 3, 2019). Internal Google PowerPoint on Ad Manager web inventory. Google's experiment measures the effects of UPR by comparing Google profits for publishers who had UPR turned on with Google profits for publishers who did not have UPR turned on during the program's rollout process. The experiment seems to maintain the auction format constant as a second price auction across the two groups of publishers.

impact of UPR is likely even larger than the full price drop observed after the rollout of the Unified Auction. Finally, I provide evidence that publishers were effectively locked into Google and since they were unable to switch services, they went to great lengths to try to circumvent UPR, demonstrating its negative impact.

a) UPR reduced the quality of ad serving for publishers

504. Google claimed that UPR made it simpler for publishers to sell their inventory. In a 2021 external presentation to buyers, Google explained: "Unified Pricing aims to remove all those complexities – one floor price across all non-guaranteed inventory. Publishers can control the floor prices across all Exchanges and buyers from one simple interface."[648]

505. Internally, Google knew that publishers preferred control over their floors and would reject UPR given the choice. An internal document explains: "Initially, the feedback from first-price announcement was positive. However, recently as we shared details of removing floor-pricing options the feedback has changed dramatically."[649]

506. Some external sources agree that UPR is a simpler tool for publishers to use. An article explaining how to optimize UPR states that "publishers agree that the unified pricing rules have simplified the auction dynamics."[650] Similarly, a Headerbidding.com article explains that the advantage of UPR is the simplification of operations ("Rather than having to maintain price floors individually among all the different platforms, all of the price floors can now be managed in one single place.") and more transparency and better-informed buyers ("Since the access and floor pricing are consistent across all platforms and partners, buyers can plan their bids better since they have a better idea of what publishers expect.")[651] This is especially true for small publishers, that have limited and unsophisticated strategies to sell their inventory.

507. However, publishers had the option of setting uniform floors across all sources of demand for simplicity's sake before UPR. It was straightforward for a publisher to set its price floors across AdX, third party exchanges, and buying tools to the same value. The "simplification" of UPR comes at the

[648] GOOG-AT-MDL-001793318, at -371. "RTB Insights". External Google PowerPoint on the programmatic ecosystem.
[649] GOOG-DOJ-AT -00569648 at -649. "Fwd: Frist-price & Removing pricing knobs" (May 11, 2019). Internal email thread with [redacted] and Nirmal Jayaram.

expense of control, revenue, and quality, as described in the rest of this section. UPR removed a feature that many publishers had previously utilized.

508. Despite claims of simplicity, UPR created challenges for publishers. UPR introduced complexity in switching to new sets of rules. An article explaining how to handle UPR to maximize revenue states: "Another important concern to note is that it is shockingly easy to make revenue-tanking mistakes when building out unified pricing rules. And each of your rules interplay with each other, so it is actually pretty easy to miss a change in one rule that breaks another. One slight misstep in a combination of multiple rules and you could actually kill your revenue."[652]

509. The ability to set flexible pricing floors is valuable to publishers, as it enables them to extract value from high-quality impressions and control ad quality. Google recognizes these uses of price floors by publishers.[653] More specifically, publishers value being able to set different floors for different exchanges and ad buying tools, not just advertisers.

510. First, the value of setting floors at the tool level is at least in part due to the large number of advertisers publishers transact with. Analyzing Google-produced data on AdX transactions, [redacted].[654] [redacted].

511. Second, publishers evaluate demand source performance by analyzing the performance of ad buying tools and exchanges. Setting price floors at the tool level matches how publishers evaluate yield. In the Waterfall, publishers optimized yield by ranking ad tech tools according to their historical performance. Even after the launch of the Unified Auction in Google's ad server, ending the use of the Waterfall, publishers still valued the ability to compare performance across tools (see Section VII.D).

[653] GOOG-NE-11809343 at 358. "DRX Unified Yield Management Strategy Review" (July 9, 2018). Internal Google PowerPoint on DRX. ("Why do pubs set up higher floors on AdX? Global Bernanke subsidizes pubs who set higher floors on AdX in general, which could be a factor; Pubs set different floors for the same buyer on different exchanges to simulate a real-time waterfall and soft floor the buyers (like DBM), and AdX primarily bears the brunt of these higher floors; Pubs have the perception that undesirable ads on AdX is correlated with low CPMs, and getting higher floors will "protect" them; Pubs have been willing to tolerate some revenue loss in exchange for reduced dependence on Google as a whole.")

[654] [redacted]

512. Third, Google buying tools have more information about users than third-party buying tools.[655] As Google's buying tools were more likely to identify high-demand impressions, setting higher pricing floors for Google's buying tools allowed publishers to extract a larger share of the value of those high-demand impressions.

513. More generally, price floors enable publishers to control the ad quality displayed on their properties.[656] There is a direct correlation between a publisher's brand perception and the effectiveness of the ads it displays on its properties. Publishers set price floors to prevent low-quality ads from being displayed on their websites, as low bids are expected to be correlated with lower-quality ads. Publishers' strong reaction to UPR highlights this desire for control over the quality of their ad inventory and the importance placed by publishers on the ability to set differential price floors at the tool level. An article covering U.K. publishers' reaction states: "As a result, the talk among U.K. publishers and supply-side ad tech vendors has reflected serious concern: Google is stripping them of control over how their inventory is valued, and their ability to control their floor prices […] "It feels like Google is treating us like children, and just taking away more control," said an executive at a major U.K. publisher."[657]

514. An internal Google document that tracked publisher responses to UPR shows that Google received pushback from publishers regarding the loss of control over their price floor. For example, a publisher named Internet Brands was using "price floors to adjust prices for each specific SSP based on the performance they see for each and they feel as they are losing control over that specifically."[658] The publisher, NewsCorp, escalated its frustration about the lack of control to Google. In a 2019 email, NewsCorp CEO Robert Thomason wrote to [redacted] that a "sudden damaging change in recent days in the ad tech relationship" left him to be disappointed in Google.[659]

---

[655] For example, in an internal communication, Google confirmed the distinct value of "user intent" information obtained from Search and Chrome activity. *See* GOOG-NE-06230051 at -052, "In-market Audiences on GDN harmful" (No Date) – Internal Google communication on use of search data as a signal for audience targeting.

[656] GOOG-DOJ-AT -01804815 at 820. "1st Price Migration Overview" (October 30, 2018). ("Pubs set higher floors on AdX for a variety of reasons […] Perception that undesirable ads correlated with low CPMs, and higher floors "protect" them.")

[657] Digiday. "It's a shakedown': Everything you need to know about Google's 'unified pricing' product changes" (April 25, 2019). Accessed on June 1, 2024. https://digiday.com/media/shakedown-everything-need-know-googles-unified-pricing-product-changes/

[658] GOOG-AT-MDL-004017152. "LPS AMS Feedback UPR" (2022). "OPG Feedback UPR" Tab. Internal spreadsheet regrouping publishers' feedback on UPR.

[659] GOOG-DOJ-09715071 at -072. "Re: Just not cricket" (October 1, 2019). Internal Google email thread discussing the complaint of Newscorp with [redacted], [redacted] and [redacted]. ("Out of personal respect for you and in full disclosure, I am going to make a few public comments in coming days re our relationship with Google. My deep disappointment stems from two things: a sudden, damaging change in recent days in the ad tech relationship; and disparaging comments made to other media executives by your senior executive responsible for News, [redacted].")

515. Google employees internally tried to understand what "sudden damaging change" Thomason was referring to. [redacted] stated that "This was prompted by the unified floors change, which they see as a loss of control as a matter of principle"[660]

b) UPR harmed publishers by lowering prices for their inventory on AdX

516. This section presents internal analyses by Google demonstrating the significant losses that publishers faced as a result of UPR.

517. An April 2020 presentation (Figure 17) looking back at the 2019 product launch reviewed the rollout of the first-price auction. The document mentions that "pubs made more money"; however, this conclusion is misleading.[661]

[660] GOOG-DOJ-09715071, at -071. (October 1, 2019). Internal Google email chain discussing the complaint of Newscorp with [redacted], [redacted] and [redacted]. ("[redacted] et al; […] The issue: Despite seeing an early -5% improvement in revenue on NewsCorp's top properties from the 1p auction change, conversations and explanations have not landed well and have led to multiple escalations. NewsCorp has raised a few primary issues as part of a November contract negotiation: 1. Requesting Bid DT joinability; NewsCorp claims joining with this file is essential for evaluating the value of their inventory, set differential floor prices for subsets of users, and measure incrementality of revenue. We believe this redaction is important for the reasons above [Redacted – Privilege] We believe there are workarounds which we have volunteered to them. 2. Requesting opt-in / opt-out for all future feature changes. This was prompted by the unified floors change, which they see as a loss of control as a matter of principle. We believe this capability is no longer necessary with a move to 1p auction pricing and disagree with this stipulation as it curtails future feature development. We don't intend to agree to these redlines for the reasons above. Other publishers, while having similar concerns, have been reasonable after discussion. Please let us know if you have feedback, questions, or advice on next steps.")

[661] GOOG-AT-MDL-007034668 at -676. "Publishers Platforms Roadshow" (April 2020). Internal Google PowerPoint on GAM.

Figure 17

[redacted]

518. The conclusion that "Pubs made more money" is misleading as the graph showing the percentage revenue change in total revenue for the top 500 publishers indicates that a large portion of publishers has a negative percentage change. [redacted].[663]

519. Another Google internal presentation reported similar findings.[664] [redacted]

[662] [redacted].

[663] Although the slide notes mention that "a lot of the individual variation in publishers is statistical noise. We probably don't have many publishers losing [redacted] revenue, as one might think from the graph on that slide" it acknowledges that some publishers lost revenue because of Google's 2019 rollouts.

[664] GOOG-DOJ-AT -02147591 at -592. "First-price auction publisher impact" (2019). Internal Google PowerPoint on the expected impact of first-price auction on publishers.

[redacted].”[665]

520. Another internal Google document from October 2019 (Figure 18) on the changes in AdX revenue in 2019 stated that, following the launches of the first-price auction format change and the UPR, average CPMs were dropping for almost all impression-price-floor buckets at the time.[666] This indicates that publisher payout per impression is going down on average in each bucket.

Figure 18

[redacted]

521. Furthermore, some publishers experienced a significant negative impact on their revenue growth and in particular those who did not set up a UPR (as, in this case, floors were defaulted to zero).[668] Those

665 [redacted]

666 GOOG-AT-MDL-000993753 at -755. (October 2019). Internal Google document on declaration in AdX revenue growth.

667 [redacted]

668 GOOG-AT-MDL-000993753 at -755. (October 2019). Internal Google document on declaration in AdX revenue growth. (“Revenue accordingly is dropping since the CPM paid by advertisers is lower in the lower price floor buckets. Impressions in a

who did not set up a UPR saw a decline in their year-on-year revenue growth rates going from [redacted], while the ones who did set up UPRs went from [redacted][669]

522. Google tracks AdX impressions and publisher net revenue for each web property.[670] The analysis in Figure 19 shows, as an illustrative example, the average monthly CPM for Daily Mail US across impressions cleared by AdX, as well as the monthly number of transactions for the publisher cleared by AdX. Following the initial roll-out of UPR and the first-price auction in May 2019, the average monthly CPM for the publisher on AdX started declining systematically until October 2019, as shown in the chart below. Over this period monthly CPM fell by around [redacted] from [redacted] in May 2019 to [redacted] in October 2019.[671] At the same time, impressions transacted through AdX rose sharply until October 2019, increasing by around [redacted] from about [redacted] to [redacted].[672]

523. These same impressions, but for UPR, would have been transacted through other exchanges and likely at higher prices given that UPR forced a reduction in floors preventing publishers from optimizing as shown in Figure 13. Quantity increases that may have resulted from UPR do not imply publisher total quality-adjusted revenue increased, even in the short-run. In the long run, as UPR dilutes publishers' ability to control the quality of their inventory, publishers' ability to monetize their business effectively is continuously reduced, exacerbating this effect.

524. This analysis also makes clear that Daily Mail's impressions were being drawn into AdX at the expense of rival exchanges due to UPR, showing the effects of this conduct on rivals' ability to compete.

---

lower price floor bucket on average have lower CPMs than impressions in a higher price floor bucket. So, queries moving to lower price floor buckets are likely gaining lower CPMs.")

[669] GOOG-AT-MDL-000993753 at -756. (October 2019). Internal Google document on declaration in AdX revenue growth. ("The cohort of pubs wo/ UPR has seen a stepper decline on y/y growth rate ([redacted] vs. those with some UPR rules ([redacted]).").

[670] 2023.09.29 Letter from [redacted] to [redacted] Appendix A, page 14.

[671] RFP-243 "AdX Submission" data is used for this analysis. The column "web_property_name" is set to "Daily Mail US – AdX." The column "is_mobile_app_request" is set to be False. The column "transaction_type_name" is set to "OA – Open Auction." CPM is calculated with the formula pub_net_rev_usd/(matched_impressions/1000) after they are aggregated by month and transaction type.

[672] RFP-243 "AdX Submission" data is used for this analysis. The column "web_property_name" is set to "Daily Mail US – AdX." The column "is_mobile_app_request" is set to be False. The column "transaction_type_name" is set to "OA – Open Auction. The column "matched_impressions" is used for the calculation.

Figure 19

[redacted]

673 [redacted]

Figure 20

[redacted]

525. As evidenced above, publishers received lower inventory prices via AdX after UPR and the auction format change (combined Unified Auction effect). The remainder of this section shows that the publishers' loss is due to UPR rather than the auction format change from second price to first price. Further, I show that the negative impact of UPR on publishers could be larger than what is observed after the co-rollout of UPR and the auction format change.

674 [redacted]

526. Google-produced data does not contain enough information to distinguish publishers affected by UPR or first-price auctions separately during the ramp-up phase.[675] As such, I cannot compare different groups of publishers to isolate the impact of UPR from auction format change using this data. Therefore, I describe the impact of equivalent auction format changes that took place on other ad exchanges in 2016 and 2019 to infer how much of the Unified Auction launch impact on publishers is due to UPR versus the auction format change.

527. The evidence discussed below shows that the clearing price (final price paid for an ad impression in an auction) should remain stable or increase after a change from a second-price auction to a first-price auction, without any change to floor-pricing rules. This means that the auction change itself should not explain the harm from price drops experienced by publishers after the launch of the Unified Auction. Therefore, any observed negative impacts on publishers after the launch of the Unified Auction is likely as a result of UPR.

528. A study by Alcobendas and Zeithammer (2021) examined how advertisers adjusted their bidding strategies following the change from second-price to first-price auction on an online advertising platform in 2019.[676] Their research demonstrates that a switch from a second-price to a first-price auction results in lower bids on the same object (e.g., to show the same ad in the same location on the same webpage), yet the clearing price is still higher than that in the second-price auction.[677] Despite the decrease in bids post-switch, the decrease was not significant enough to make the clearing price below its previous levels under the second-price auction.

529. The paper illustrates that, following the auction pricing rule change, bidders bid on the ad slot as if the change suddenly increased their valuations of an impression by at least 30% for at least three months after the change. Specifically, advertisers ended up paying an average of 35% more for impressions in the three months following the auction rule change, and this increase is attributed to insufficient bid shading and increased competition caused by both new entries and insufficient bid

[675] Google produced data "AdX Historical Breakdown" has the column "has_unified_price_floor," but it shows as "False" or missing for all publishers, even after UPR was fully launched.
[676] Alcobendas, Miguel, and Robert Zeithammer. "Slim Shading in Ad Auctions: Adjustment of Bidding Strategies After a Switch to First-Price Rules." 2023.
[677] Note that bids should decline after the switch, ceteris paribus, because auction winners suddenly have to pay their own bid instead of the second highest bid. The bid-reduction below valuation (which is the dominant-strategy bid under second-price rules) is called "bid shading" in both industry and academia. *See* Alcobendas, Miguel, and Robert Zeithammer. "Slim Shading in Ad Auctions: Adjustment of Bidding Strategies to First-Price Rules." 2023.

shading by other bidders.[678] Thus if anything, we should expect publisher ad prices to rise after the change from second price to first price auction, not fall.

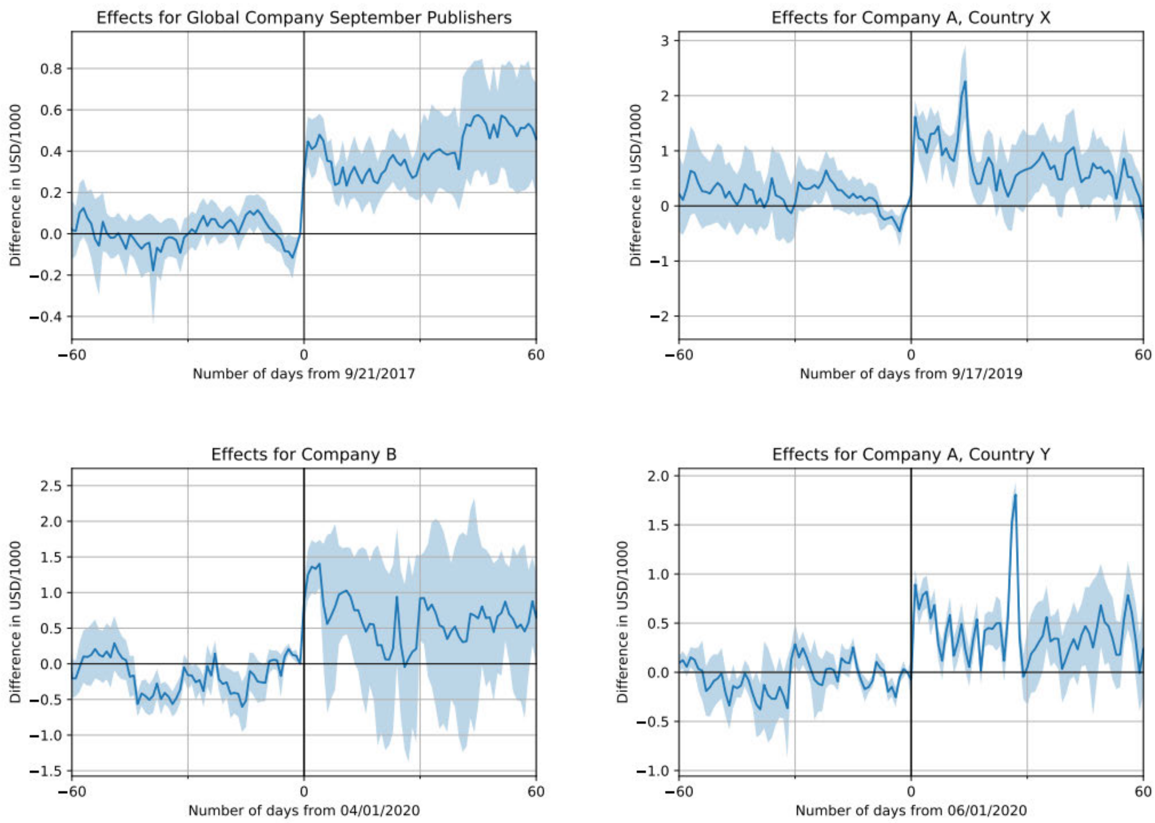
530. Another paper by Shumpei Goke and co-authors (Goke et al., 2022) explored bidders' responses when publishers in the ad exchange platform AppNexus/Xandr switched from second-price to first-price auctions from 2017 to 2020.[679] The paper finds that "immediately after the auction format change, the revenue per sold impression (price) jumped considerably for the treated [i.e., switched] publishers relative to the control [i.e., non-switched] publishers, ranging from 35% to 75% of the pre-treatment price level of the treatment group."[680] But "in later auction format changes, the increase in the price levels under first-price auctions relative to price levels under second-auctions dissipates over time."[681]

531. The figure below illustrates the differences in prices between similar publishers who switched to first-price auctions and those who did not. Specifically, publishers switched from second-price to first-price auctions in four batches (September 2017, September 2019, April 2020, and June 2020). Switched publishers experienced increases in the price, and the increase can last for more than 2 months post-switch.[682]

[678] Alcobendas, Miguel, and Robert Zeithammer. "Slim Shading in Ad Auctions: Adjustment of Bidding Strategies After a Switch to First-Price Rules." 2023.
[679] Goke, Shumpei, Gabriel Y. Weintraub, Ralph Mastromonaco, and Sam Seljan. "Bidders' Responses to Auction Format Change in Internet Display Advertising Auctions." 2022.
[680] Goke, Shumpei, Gabriel Y. Weintraub, Ralph Mastromonaco, and Sam Seljan. "Bidders' Responses to Auction Format Change in Internet Display Advertising Auctions." 2022. pg. 3.
[681] Goke, Shumpei, Gabriel Y. Weintraub, Ralph Mastromonaco, and Sam Seljan. "Bidders' Responses to Auction Format Change in Internet Display Advertising Auctions." 2022. pg. 1.
[682] Goke, Shumpei, Gabriel Y. Weintraub, Ralph Mastromonaco, and Sam Seljan. "Bidders' Responses to Auction Format Change in Internet Display Advertising Auctions." 2022. pg. 14.

Figure 21

Figure 4 from Goke et. Al (2022) showing the estimates on the impact of switching from second-price to first-price auction[683]



532. The paper further notes that "the price levels under FPA [i.e., first-price auction] and SPA [i.e., second-price auction] eventually converge."[684] Therefore, the auction change itself did not make publishers worse off and tends towards equivalence as economic theory, outlined above, predicts.

533. The above empirical evidence in the academic literature is also supported by internal documents stating that after the change from SPA to FPA: "Many buyers are continuing to submit high bids and

683 Goke, Shumpei, Gabriel Y. Weintraub, Ralph Mastromonaco, and Sam Seljan. "Bidders' Responses to Auction Format Change in Internet Display Advertising Auctions." 2022. pg. 14. The solid line indicates point estimates, and the band indicates 95% confidence intervals. zero in the x-axis indicates the time when the publishers switched from second-price to first-price auctions.
684 Goke, Shumpei, Gabriel Y. Weintraub, Ralph Mastromonaco, and Sam Seljan. "Bidders' Responses to Auction Format Change in Internet Display Advertising Auctions." 2022. pg. 3.

paying the full amount, eliminating the auction discount."[685] Due to not enough bid shading, buyers are paying more in the short-term until they adjust to the FPA.

534. In sum, the downturns in inventory price after UPR and the auction transition are due to UPR negatively affecting publishers.

c) Publishers attempted to circumvent UPR to avoid its negative impact on yields

535. As I described in Section V.C.2, publishers that wanted to migrate to another ad server faced high switching costs. Rather than switching away from DFP, some publishers attempted to circumvent UPR. Prior to unified pricing floors, publishers could set up to 5,000 different floors.[686] With UPR, publishers were limited to 200 rules, which were further limited to per advertiser floors. This increased from the initial 100 rules after Google received backlash from publishers.[687]

536. Large publishers typically used far more than 200 rules before UPR. An article explaining the "shakedown" of the UPR roll-out highlights: "Large publishers typically use hundreds upon hundreds of rules for different buyers, including Google."[688] Another article states: "but the unified pricing changes restrict publishers to setting only 100 rules. Many big publishers, like The New York Times and The Weather Company, use hundreds of different rules at a time. They worry that the changes to unified pricing will keep them from setting consistent pricing for their advertisers."[689]

537. Internal documents demonstrate Google's awareness of publishers' growing frustration over UPR.[690] Despite this frustration, publishers had no choice other than to attempt to circumvent UPR. In an

[685] GOOG-TEX-00682264 at -265. "Re: Unified Auction Changes (Sellside) Executive Update" (August 19, 2019). Internal email thread with [redacted], [redacted], [redacted], [redacted].
[686] Australian Competition Consumer Commission. "Digital advertising services inquiry. Final report." pg. 85. (August 2021). https://www.accc.gov.au/system/files/News%20Corp%20Australia%20%2815%20May%202020%29.pdf ("It also limits the number of rules a publisher can use when selling inventory to 200, which is significant because publishers could previously set up to 5000 rules.")
[687] Australian Competition Consumer Commission. "Digital advertising services inquiry. Final report." pg. 85. (August 2021). https://www.accc.gov.au/system/files/News%20Corp%20Australia%20%2815%20May%202020%29.pdf
[688] Digiday. "'It's a shakedown': Everything you need to know about Google's 'unified pricing' product changes" (April 25, 2019). Accessed on May 31, 2024. https://digiday.com/media/shakedown-everything-need-know-googles-unified-pricing-product-changes/; *See also* AdExchanger. "Publishers Lash Out Against Google Over 'Unified Pricing' Changes" (April 18, 2019). Accessed on June 1, 2024. https://www.adexchanger.com/online-advertising/publishers-lash-out-against-google-over-unified-pricing-changes/ ("Based on the heated meeting, a Google spokesperson also said that it would consider revisiting the 100-rule limit if testing showed that number was too low.")
[689] AdExchanger. "Publishers Lash Out Against Google Over 'Unified Pricing' Changes" (April 18, 2019). Accessed on June 1, 2024. https://www.adexchanger.com/online-advertising/publishers-lash-out-against-google-over-unified-pricing-changes/
[690] *See* GOOG-DOJ-AT -02274670 at -671. "Re: Roll-out of UPR on priority inverted line items" (August 7, 2019). Internal email thread between [redacted], [redacted], [redacted], [redacted] and others. ("We are currently in an RFP process for a contract renewal. This topic would add additional complexity to already mentioned challenges lead to escalations on partner side (GDPF decisions, UPR buyer floors deprecation, UPR short notices etc)"; "We are saying internally

internal thread, a Google employee states: "We should expect publishers to try this, and other things and share them with each other. As you know, there are entire events dedicated to hacking this in the market […]."[691]

538. Google highlights three main strategies for publishers to circumvent UPR. Each involves considerable effort and inefficiency for the publisher in managing and reporting on their inventory. The first one includes line item exclusion, the second involves setting high UPR and transacting third parties as house ads with CPMs, and the third concerns mobile apps.[692] These strategies rely on the fact that UPR does not apply to all line item types. In particular, it does not apply to house line items, line items with zero rate and no Value CPM set, AdSense backfill, and programmatic direct campaigns.[693]

539. Examples of publishers implementing these circumventing strategies are also discussed in internal threads. In a 2019 email, a Google employee mentioned that the publisher Stroer was using a line item exclusion strategy to circumvent UPR.[694]

540. Similarly, DotDash used a "House" strategy to circumvent UPR.[695] A Google employee stated that "the publisher DotDash [is] a known publisher attempting to circumvent UPR by utilizing House to capture prioritized REV."[696]

---

that we want to close a loophole, however the partner is stating they have followed an approved procedure and complains we change our minds to[o] often with short notice. Behind the background that we are just in an RFP process with them where they criticising us for announcing with too short notice (GDPR adaptations, UPR rollout, Video SDK enforcement) this is just another incident adding to their picture.")

[691] GOOG-DOJ-AT -00175537 at -538. "Re: DotDash UPR Circumvention" (September 26, 2019). Internal email thread between [redacted], [redacted], [redacted], [redacted], [redacted], [redacted], and others.

[692] GOOG-DOJ-AT -00175537 at -537. "Re: DotDash UPR Circumvention" (September 26, 2019). Internal email thread between [redacted], [redacted], [redacted], [redacted], [redacted], [redacted], and others. ("There are 3 primary methods of circumvention strategies we are aware of: 1) LI exclusion (beta) – probably the most clear, easy to detect, and will be less adopted than house (is our expectation) 2) House – setting high UPRs and trafficking 3rd parties (HB and otherwise) as house with CPMs. Can be detected by house LI reporting filtered on CPMs and advertisers. This will likely be the most commonly used. 3) Mediation – mostly for app – yet to be determined if this will get picked up and use (but it's possible)").

[693] Headerbidding.co. "What is Unified Pricing in Google Ad Manager" (August 26, 2021). Accessed on June 1, 2024. https://headerbidding.com/programmatic-101/unified-pricing-in-google-ad-manager/ ("However, unified pricing rules do not apply to the following: Programmatic direct campaigns. This includes programmatic guaranteed — standard and sponsorship — as well as preferred deal line items.; AdSense backfill.; House line item types.; Line item types with a zero rate and no value CPM set.")

[694] GOOG-DOJ-AT -02274670 at -670. "Re: Roll-out of UPR on priority inverted line items" (August 7, 2019). Internal email thread between [redacted], [redacted] [redacted], [redacted] and others. ("there are 2 strategies Stroer is following.").

[695] House Ads are in-house marketing ads. House ads are usually the last item type (priority 16), coming after guaranteed inventory and all other non-guaranteed line item type. House ads are "non-paying." Google explains that "If a publisher wants to make sure there is never a blank ad slot on the page they can run house campaigns as the last result." *See* GOOG-AT-MDL-001793318 at -364. "RTB Insights". External Google PowerPoint on the programmatic ecosystem.

[696] GOOG-DOJ-AT -00175537 at -539. "Re: DotDash UPR Circumvention" (September 26, 2019). Internal email thread between [redacted], [redacted], [redacted], [redacted], [redacted], [redacted], and others.

541. [redacted] is not the only publisher implementing this "House" strategy. The presentation takes a deeper dive into analyzing the House Ads trend in revenue and line items for [redacted] It notes that while Header Bidding impressions and revenue decreased following the UPR launch, that trend was reversed as the publishers increased their usage of House Ads Line Items. The presentation concludes that "HA HB Circumvention goes against the spirit of UPR", that "HB usage, while dampened, has reverted and continues to grow," and that Google needs to manage "pubs desire for revenue diversification away from Google."[697] A Google employee working on this deck also expressed [redacted]."[698]

542. Google heavily scrutinized these circumventing strategies. Google employees explain that they "are watching […] pretty closely."[699] In February 2020, Google created a communication document to prevent publishers from "intentionally working around the unified floor price, potentially making more money in the short-term."[700]

543. Google took steps to shut down these circumventing strategies. A 2020 article explains that Google shut down the House tag as a way to prevent publishers from escaping UPR.

544. To conclude, UPR took place in Google's ad server. UPR harmed competition in the ad exchange market by giving AdX an advantage over third-party exchanges through lower floors and enabling AdX and Google's ad buying tools (DV360 in particular) to transact more impressions at the expense of third-party tools.

545. Google may argue that UPR simplified ad serving for publishers. As I have described above, Google's claim of simplified ad serving for publishers was pretextual and UPR actually created significant confusion and reduced ad serving quality. Moreover, with UPR, publishers had less choice and less ability to evaluate demand sources as publishers could no longer set per-ad buying tool floors.

546. While, as already noted, the ability to set reserve prices flexibly does benefit sellers, potentially to the detriment of advertisers, and, thus, this potentially represents a transfer from one consumer group to

[697] GOOG-AT-MDL-008107072 at -086. "Analysis of Demand Not Subject to UPR" (November 2019). Internal Google PowerPoint on publishers circumventing UPR.
[698] GOOG-AT-MDL-008107072 at -073. "Analysis of Demand Not Subject to UPR" (November 2019). Internal Google PowerPoint on publishers circumventing UPR.
[699] GOOG-DOJ-AT -00175537 at -538. "Re: DotDash UPR Circumvention" (September 26, 2019). Internal email thread between [redacted], [redacted], [redacted], [redacted], [redacted], [redacted], and others. ("We are watching [redacted] pretty closely and wanted to show you an example of what we thing is an example of this (but we are not sure).").
[700] GOOG-DOJ-AT -02277330 at -331. "PR Comms Doc: Policy Changes for Ad Manager Line Items" (November 20, 2019). Internal Google PR document on how to communicate about UPR circumvention.

another. As publisher ad server providers compete for publishers and not advertisers, a competitive provider would be expected to act in the interests of publishers and, therefore, not impose restrictions that benefit them. In this regard, even if there were evidence that such restrictions assisted other customers of Google, this would not counter the intent and effect of Google's conduct here that arose jointly out of its market power in ad servers, its vertical integration throughout the ad tech stack and the benefits it received from steering and subverting the ability of publishers to exercise competitive choice amongst ad exchanges. I am unaware how UPR could reduce total surplus to all consumers. If Google suggests any further benefits of UPR, I plan to evaluate such claims.

B. Google introduced Dynamic Allocation in a way that impaired real-time competition between exchanges, increased transactions on AdX, and increased its monopoly power in the exchange market

547. The second change to ad server operations implemented by Google came with the way they implemented Dynamic Allocation (DA). DA refers to the way Google offered inventories to exchanges and other intermediaries that impeded competition in the ad exchange market. When initially implemented by DoubleClick, before its acquisition by Google, represented an improvement over previous sequential processes by which the ad server called ad networks which did not bid in real time known as the Waterfall. The Waterfall process led to publishers missing out on more valuable ad inventory allocation.

548. In its implementation of DA after the acquisition of DoubleClick, Google made and maintained critical choices with the intention of steering inventory to its AdX exchange compared to other intermediaries, without providing benefits to publishers. Those choices were:

- AdX was afforded a right of first refusal on publisher's non-guaranteed inventory. This meant that AdX was offered the opportunity to submit a live bid on each impression; if AdX did not win the impression, only then was it offered to third-party exchanges in the Waterfall.

- For many years, the DA afforded AdX a 'last look' advantage that other intermediaries did not receive. When bidding against exchanges bidding through Header Bidding, last look increased AdX's probability of winning the impression.

549. These actions were primarily motivated by Google's desire to maintain an information advantage over other exchanges in its ability to match high demand impressions with advertisers willing to pay high prices. Publisher use of the more costly-to-implement approach, Header Bidding, demonstrates that

publishers wanted exchanges to compete for their impressions simultaneously. Google's eventual move to Exchange Bidding illustrates aspects of the counterfactual that would have arisen had Google not been integrated across the ad tech stack.

550. The antitrust harm arising from these actions has the same economic structure as the harm identified with respect to UPR analyzed in the previous section. Specifically, if Google were operating without monopoly power in ad server tools and was not integrated into ad exchanges, Google would not have had the ability to use restrictions of DA to impede competition amongst all exchanges for publisher ad inventory as this would have led to publishers adopting ad server tools of other providers. In addition, had Google not been vertically integrated into the exchange market, it would not have had the incentive to use its market power in the ad server market to steer transactions towards its own ad exchange, AdX. Thus, comparing the factual (how Google implemented DA) with the counterfactual (that would have arisen had Google either not had monopoly power in ad servers or had not used that monopoly power to favor its own ad exchange), it can be seen that the way Google chose to implement DA harmed competition in the exchange market.

551. The following discussion will present evidence relevant to Google's conduct with respect to DA, the choices it faced, its intent when making those choices, and evidence that this resulted in the predicted harm to competition in the exchange market.

1) DoubleClick's DA before the acquisition by Google

552. DoubleClick launched its ad exchange in 2007 before Google acquired it in 2008.[701] Along with the exchange, DoubleClick also launched a feature called Dynamic Allocation.[702] At the time, DA was

---

[701] Google Official Blog. "We've officially acquired DoubleClick" (March 11, 2008). Google Official Blog. Accessed on May 30, 2024. https://googleblog.blogspot.com/2008/03/weve-officially-acquired-doubleclick.html

[702] Google's First Am. Resps. and Objs. to Plaintiff's Third Set of Interrogs. (May 24, 2024) at 11. *See also* DoubleClick. "DoubleClick Advertising Exchange" (undated). Accessed on May 30, 2024. https://web.archive.org/web/20071001100309/http://www.doubleclick.com/products/advertisingexchange/index.aspx ("DoubleClick's proprietary Dynamic Allocation system sells inventory through the channel that pays the highest price, in real time.").

part of DoubleClick's ad server logic[703] used to "determine what inventory to allocate to the Exchange"[704] to solicit bids in "real-time."[705]

553. When DA launched, DoubleClick's ad server followed a Waterfall process to determine which ad network would purchase the impression. Ad impressions are routed to demand sources via a Waterfall method.[706] The Waterfall method is a sequential auction process where the ad server evaluates the line items for each demand source eligible to serve the impression, such as a direct deal or ad network, in a pre-determined priority order. Ad networks could not run real-time auctions. Upon receiving a request, an ad network responds to the ad server whether it will purchase the impression or not. Demand partners with little bid history had a low chance of winning the impression.

554. Publishers set the priority order for each line item based on negotiated deals, historical CPM performance, or some other measure. The demand source with the highest historical CPM would get the first bite at the impression, and if the demand source could not clear the floor price, then the impression would be routed to the demand source with the next highest historical CPM. Along with setting the priority, the publisher also indicates the net CPM value each line item would be willing to pay for an eligible impression. Publishers typically determine the net CPM based on estimates of what the impression is worth or pre-determined deals with the demand partner.

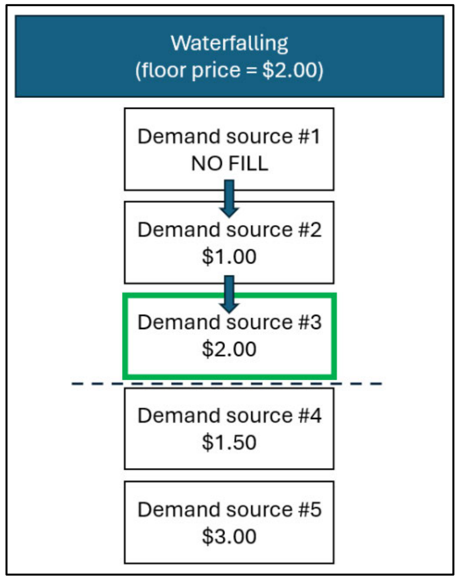
555. For each line item, the ad server determined if it was eligible to fill an impression. The ad server followed the Waterfall process to evaluate the price each would pay for the impression.[707] Once the ad server identified an eligible line item that can purchase the impression at a net CPM that clears the publisher's price floor, the Waterfall process concluded, and the demand source was selected to serve the impression. See Figure 22 below for a model of the Waterfall auction process.

---

[703] GOOG-NE-07798164 at -167. "Re: 1P Auction GTM narrative – Last Look concerns" (February 28, 2019). Email discussing narrative around shift to 1P auction. ("What I would absolutely like to convey is that our ad serving logic is changing and that it's changing in a way we believe it promotes fairness. Non-guaranteed line items used to be able to act as a second price in the Ad Manager auction but could not be 2nd priced themselves – this was the foundation of making indirect demand ad serving choices (dynamic allocation) and this is changing.")
[704] DoubleClick. "DoubleClick Advertising Exchange" (October 18, 2007). Accessed on May 30, 2024. https://web.archive.org/web/20071018015601/http:/www.doubleclick.com/insight/pdfs/dc_adxoverview_0704.pdf
[705] DoubleClick. "DoubleClick Advertising Exchange" (undated). Accessed on May 30, 2024. https://web.archive.org/web/20071001100309/http://www.doubleclick.com/products/advertisingexchange/index.aspx
[706] ClearCode. "What's the Difference Between Waterfall Auctions & Header Bidding?" (February 5, 2024). Accessed on May 30, 2024. https://clearcode.cc/blog/difference-waterfall-header-bidding/#:~:text=The%20by%2Dproduct%20of%20this,impressions%20are%20(hopefully)%20sold ("The by-product of this was the waterfall auction – also known as daisy-chaining or waterfall tags. In this process, a publisher passes its inventory from ad network to ad network in descending order of importance until all impressions are (hopefully) sold.")
[707] Deposition of [redacted] (Project Manager, Google), 33:3-33:13, August 12, 2021. ("Q. What is a waterfall? A. A waterfall isn't an auction at all. […] For ad tech a waterfall refers to the process whereby a network is called, the network sees if it has a bid for a buyer of the particular inventory, and if not, calls another network that would then see if it has a buyer for the inventory. And if not, it would call another network or system or whatever.")

Figure 22

Model of the Waterfall auction process



556. While the winning demand source, Demand Source #3, cleared the $2.00 price floor, the Waterfall process doesn't select a higher-paying demand source. Demand Source #5, which was ranked lower than Demand Source #3, was willing to pay more than Demand Source #3 but was never considered by the publisher ad server for the impression.

557. DA, as first implemented by DoubleClick, employed a real-time bidding auction process to limit the scenario described above from happening by giving its ad exchange the opportunity to run a real-time auction for eligible impressions. At the time that DoubleClick developed DA, the demand sources in the Waterfall were networks. Rather than running a real-time bidding auction and returning a live bid, networks simply purchased or did not purchase the impression when called in the Waterfall.

558. DA, both as first implemented by DoubleClick and later by Google's DFP, shared the highest net CPM value determined by the Waterfall process with AdX as a price floor to beat.[708] AdX buyers then bid

[708] DoubleClick Ad Exchange (undated). "Profiting from Non-Guaranteed Advertising: The Value of Dynamic Allocation & Auction Pricing for Online Publishers" p.3. [White Paper]. https://web.archive.org/web/20170830013310/http:/static.googleusercontent.com/media/www.google.com/en/us/adexchange/DC_Ad_Exchange_WP_100713.pdf ("Dynamic allocation passes to the Ad Exchange the CPM value associated with the ad that the primary ad server has selected and is about to serve. The technology then uses this CPM value as the minimum CPM for the auction.")

in real-time for the impression, and if an AdX buyer could clear the price floor, the buyer would win the impression over the demand source selected by the Waterfall process.[709]

559. Ad serving logic powers the ad selection process for a publisher ad server. To understand how DA manipulated DFP, it is useful to explain how DFP's ad selection process was designed.

560. When a user accessed a website, the incoming impression triggered an ad request to DFP to fill available ad slots. Specific information about the user and the device is shared in the ad request, enabling DFP to create a "list of all line items matching the targeting criteria."[710]

561. As Google explains, "if the request comes from a man in California using Linux:

- A line item or yield group[711] targeting Men in California is on the list;
- A line item or yield group targeting Men in California on Windows is not on the list;
- A line item or yield group targeting Men in Vermont is not on the list."[712]

562. If the publisher ad server determined the incoming impression was not cleared by a guaranteed line item, the impression became available to AdX and lower-priority remnant inventory.[713]

563. DFP's ad selection process determined whether non-guaranteed line items were eligible to serve an incoming impression. Of those line items, DFP selected the highest CPM line item, and DA shared that with AdX as the price floor. AdX then ran a real-time auction among its own buyers, and the highest AdX

---

[709] Declaration of Nitish Korula (Engineering Director, Google), Paragraph 32, August 4, 2023. ("Using Dynamic Allocation, DFP established a "floor price" for AdX bids to beat, based on the highest price of any of the publisher's eligible booked, static remnant line items (which a publisher could configure based on the estimated price of each remnant line item or a fixed price the publisher had negotiated with a particular remnant demand partner). AdX buyers would then submit real-time bids to try to beat this floor.")
[710] Google Ad Manager Help. "Ad selection white paper" (undated). Accessed on May 30, 2024. https://support.google.com/admanager/answer/1143651?hl=en&ref_topic=7506292&sjid=10501155603162982449-NC#an-ad-request-passes-information-to-the-ad-server
[711] Google describes yield groups as a way for publishers to specific targeting criteria for AdX, Open Bidding, and or mediation for mobile apps. *See,* Google Ad Manager Help. "Create and manage yield groups" (undated). Accessed on May 30, 2024. https://support.google.com/admanager/answer/7390828?hl=en ("Yield groups allow you to specify what inventory you want to sell with Ad Exchange, Open Bidding, or mediation for mobile apps.")
[712] Google Ad Manager Help. "Ad selection white paper" (undated). Accessed on May 30, 2024. https://support.google.com/admanager/answer/1143651?hl=en&ref_topic=7506292&sjid=10501155603162982449-NC#an-ad-request-passes-information-to-the-ad-server
[713] GOOG-NE-11926658 at -708. "Display Ecosystem Boot Camp" (undated). Internal presentation from DoubleClick Ad Exchange by Google. ("DFP goes through its normal ad selection process, ignoring AdExchange for now. If it selects an ad booked at a priority at or below AdX, an AdX auction is triggered.")

bidder would win if it cleared the floor price.[714] If not, the impression was sold to the highest paying, directly booked, non-guaranteed ad.

564. For example, consider line items on DFP to be ads the publisher can serve to an incoming impression. The price the advertiser will pay (or the price the publisher expects the advertiser will pay) if the ad is served is listed as the CPM for that line item, and the advertiser's targeting criteria for these ads, such as the type of device or location of the impression, is included with the line item as well. Publishers prioritize these line items based on various factors, including delivery terms agreed upon with the advertisers (e.g., guaranteed or non-guaranteed ads) and CPM. Thus, when an incoming impression matches the targeting criteria of the line items, DFP selects the most eligible line item to serve the impression based on the publisher's inputted prioritization.

565. If the impression matches the targeting criteria for a non-guaranteed line item (i.e., an ad that has offered to pay a certain CPM, or the publisher has an estimate of the CPM the advertiser pays on average but does not have contractual delivery terms), DFP should select that line item to serve the impression.

566. DA kicks in at this point to give AdX an opportunity to bid in real-time on the impression, using the CPM of the line item that would serve the impression as a price floor. If AdX can secure a higher bid for the inventory than the line item selected by DFP, it will serve the impression.

2) Google's DA harmed competition in the exchange market

a) DA after the take-off of real-time bidding

567. RTB technology was developed in the early 2010s and presented an opportunity to alleviate the problems of the Waterfall process. According to Google, real-time bidding allows an ad exchange, like AdX, to send a buyer "information about an impression as it's happening. The buyer analyzes it, then returns a bid and ad tag[715]" to be submitted to the overall auction.[716] Yield management[717] companies,

[714] DoubleClick Ad Exchange (undated). "Profiting from Non-Guaranteed Advertising: The Value of Dynamic Allocation & Auction Pricing for Online Publishers" 2010. DoubleClick by Google. p.3. [White Paper]. https://web.archive.org/web/20170830013310/http:/static.googleusercontent.com/media/www.google.com/en/us/adexchange/DC_Ad_Exchange_WP_100713.pdf ("The CPM value associated with the ad that the primary ad server has selected and is about to serve. The technology then uses this CPM value as the minimum CPM for the auction. If the Ad Exchange can provide the publisher with a net CPM value higher than they would have gotten from delivering their directly booked, non-guaranteed ad, the Ad Exchange will deliver an ad. If, however, the directly booked ad's CPM value is higher, it ignores any bids coming in from the Ad Exchange.")

[715] Deposition of [redacted]

such as AdMeld, started to capitalize on the opportunity to offer publishers RTB services to manage their inventory yield around 2010.

568. After this RTB technology became widespread in display advertising around 2010, ad exchanges progressively replaced ad networks as the intermediary competing for impressions via the Waterfall. When called by the ad server, an exchange runs a real-time auction. At that time, DA no longer represented the innovation first introduced by DoubleClick. Instead, Google's ad server refused to provide publishers with the ability to solicit simultaneous live bids from multiple exchanges or at least the choice of how to rank exchanges to solicit live bids from. DA allowed AdX to always have an opportunity to transact an impression, even if a rival exchange might have offered a better price to the publisher. DA also afforded AdX with a last look by granting AdX information about rivals' historical performance to conduct its auction.

569. DA allowed AdX, and only AdX, to compete in real-time against all non-guaranteed inventory, which was priced at a historical, average price, not a live auction price.[718] Google's 2010 announcement described how its ad server let its ad exchange compete in real-time against the other exchanges' static prices.[719] As publishers have shared, DA and the lack of real-time bidding for all demand partners on DFP led to the rise of Header Bidding.[720] Google understood that publishers were harmed by this feature of DA and that Header Bidding was the result of publishers seeking better prices.[721]

[716] GOOG-NE-11926658 at -688. "Display Ecosystem Boot Camp." (undated). Internal presentation from DoubleClick Ad Exchange by Google. ("An AdX feature is whereby AdX sends a buyer information about an impression as it's happening. The buyers analyze it, then returns a bid and ad tag to be submitted to the overall AdX auction.")

[717] GOOG-NE-11926658 at -677. "Display Ecosystem Boot Camp." (undated). Internal presentation from DoubleClick Ad Exchange by Google. ("Yield manager: a third party which manages buyers like ad networks on behalf of a publisher. Its goal is to increase overall yield for the publisher by allocating the publisher's available impressions among each buyer in an optimal fashion.")

[718] GOOG-NE-08112779 at -794. "PBS Basics Training (3) AdX Basics" (undated). Google internal presentation.

[719] Google (undated). "Maximizing advertising revenues for online publishers". [White Paper]. https://static.googleusercontent.com/media/www.google.com/en//googleblogs/pdfs/revenue_maximization_090210.pdf ("Through integration with DFP it can "dynamically allocate ads. Dynamic allocation is a unique technology that works by passing to the Ad Exchange the CPM value associated with any non-guaranteed ad that DFP is about to serve.")

[720] AdExchanger. "The Rise Of 'Header Bidding' And The End Of The Publisher Waterfall" (June 18th, 2015). Accessed on May 30, 2024. https://www.adexchanger.com/publishers/the-rise-of-header-bidding-and-the-end-of-the-publisher-waterfall/ ("Among the boosters of header bidding, this close tie-in between two Google platforms is sometimes viewed as an obstruction to progress. Once they integrate with AdX, publishers can get better yield by enabling the "dynamic allocation" and "enhanced dynamic allocation" features, which give AdX a chance to beat other demand in the ad server, even if it's not its turn."); *See also,* Digiday. "An ad tech urban legend": An oral history of how header bidding became digital advertising's hottest buzzword (June 16, 2017). DigiDay. Accessed on May 30, 2024. https://digiday.com/media/header-bidding-oral-history/ ("Fed up with how Google's ad server favored its own exchange, over the past two years many publishers restructured their tech stacks to simultaneously offer inventory to multiple exchanges before making their ad calls.")

[721] GOOG-DOJ-27769247 at -268. "Header Bidding and FAN" (September 2, 2016). Internal Google presentation. Slide describing the functioning of Dynamic Allocation titled "Inefficient workflow led to the rise of Header Bidding." ("Pubs losing money here – want better pricing and "auction of auctions" giving rise to Header Bidding.")

570. In particular, DA enabled Google to override the Waterfall hierarchy that often resulted in AdX ranking lower than other exchanges.[722] In sum, Google's implementation of DA after the advent of RTB overrode the publisher's decision to rank AdX lower in their Waterfall setups.

b) DA harmed publishers by foreclosing access to incremental demand outside of AdX

571. In DFP, third-party demand sources are set up at Priority 12, the same as AdX, but they are ranked based on their historical performance, specifically the CPM rate. The CPM rate is not an absolute reflection of the true value that a publisher can get from a live bid; it is just used to rank the demand sources for the current impression. Publishers can adjust the rate to reflect the true CPM delivered by the demand source based on the historical revenue received and the number of impressions sold. Consequently, this rate reflects an expected price derived from the demand source's past performance.

572. The AdX floors from DA were often not an accurate representation of publishers' opportunity cost. DA then introduces the risk of missed yield opportunities and high opportunity costs. The underlying issue stems from the possibility that third-party exchanges have unique demand sources capable of outbidding those in AdX. Due to publishers' potentially inaccurate setting on CPM rates, impressions might not be served through the highest-bidding exchange.

573. Not all exchanges host identical demand sources due to variations in DSP integration. A Google internal presentation underscores the diverse factors influencing demand source discrepancies across exchanges. These factors include distinct pricing algorithms, different advertiser policies, buyer preferences, and publisher controls.[723] Consequently, certain demand sources may not be universally available across all exchanges, potentially resulting in varied bids for similar impressions.

---

[722]GOOG-DOJ-14875108 at -110. "Inventory access – Strategy Summit 2-pager" (August 15, 2014). Internal Google strategy document on yield optimization on display.
: ("[…] today yield optimization happens through impressions being passed to one exchange / buyer with a certain minimum CPM (floor), and if they can't meet the floor, it gets sent to a "100% fill exchange" – most often AdSense/AdX. Currently 20+% of the impressions on AdX and AdSense are "Passbacks" from other exchanges […].") The document states that Google has "a very strong position as a '100% fill exchange'."
[723] GOOG-DOJ-AT -01811903 at -913. "A buy-side overview to publisher yield: Header Bidding, First Look, and Exchange Bidding" (November 2016). Internal Google presentation. ("There are many potential reasons for unique demand but here are a few common ones: Exchanges have different pricing algorithms which impact the delivered CPM, Exchange advertiser policies can vary…Buyers favor certain exchanges because of differences in integrations… each exchange offers different controls to block advertisers…exchanges can also give priority treatment for particular pubs for various reasons".)

574. A Google presentation described how Google expected there to be discrepancies between the "average price" captured by third-party demand sources' CPM rate used as the AdX floor and the "auction price", representing their real CPM potential lost as a result of DA. [724]

575. Publishers may incur losses due to AdX's prioritization in DA, even when third-party exchanges can offer higher bids than AdX. For instance, a publisher may set a CPM rate of $3 on AdX and $5 on other exchanges based on historical performance. The highest bid in AdX is $4, whereas the alternative exchange has a unique demand source, bidding $6 for the same impression. DA's preference for AdX will lead to the impression being served by AdX at $4 rather than passing through it to the alternative demand source and getting it transacted at $6. This scenario exemplifies how DA can be inconsistent with publishers' real opportunity costs for an impression by prioritizing AdX over potentially higher-yielding demand sources for specific impressions. This is especially true if publishers' reporting of average CPM rates across exchanges isn't frequently updated.

576. Google admits that there is a difference in bidding patterns for different impression types across ad-buying tools. The competitiveness of bids reflects, at least in part, differences in advertisers' willingness to pay for different impressions across buy-side tools. For example, a Google presentation showed the difference between GDN and Criteo's performance, especially on high bids.[725] [redacted].[726] [redacted].[727] Google also recognized that different ad-buying tools have different bidding patterns and focus on different impression types. For example, Google stated that: "Criteo bids a lot and fairly consistently across all publisher buckets and platforms."[728]

577. In the long-term, as more impressions triggered DA, and fewer opportunities for third-party demand sources to adjust their prices are narrowed, the historical CPM information used to set AdX floors likely also became a less accurate prediction of third-party demand sources' real CPM potential.

---

[724] GOOG-DOJ-27769247 at -268. "Header Bidding and FAN" (September 2, 2016). Internal Google internal presentation.
[725] GOOG-AT-MDL-001777087 at -107. "DVAA Metrics Review: Health of the Display & Video Business" (November 9, 2016). Internal Google presentation. (When Criteo wins, GDN is less competitive, indicates that our competition see real valuation differences.".
[726]GOOG-AT-MDL-001777087 at -107. "DVAA Metrics Review: Health of the Display & Video Business" (November 9, 2016). Internal Google presentation. [redacted]
[727] GOOG-AT-MDL-001777087 at -107. "DVAA Metrics Review: Health of the Display & Video Business" (November 9, 2016). Internal Google presentation. ([redacted]
[728] GOOG-AT-MDL-019125473 at -488. "Growing Google's Share" (August 2018). Internal Google presentation.

c) Google's acquisition of AdMeld gave it the technical opportunity to grant publisher choice of third party ad exchanges but Google chose not to

578. The conduct described above focuses on the way Google implemented DA, specifically, in a way that made it difficult for publishers to distribute transactions between ad exchanges according to a level-playing field. This conduct advantaged Google at the expense of publishers. Here, I explain that the acquisition of AdMeld gave Google the technology that allowed its ad server to solicit bids in real-time from all exchanges (including AdX) in a way that publishers would prefer. Between 2010-2011, RTB spending increased substantially.[729] Google, however, decided not to bring that technology to market to build its ad exchange market power.

579. AdMeld's implementation of RTB provided Google with an alternative to DA as it allowed different demand sources, including ad exchanges, to simultaneously compete for impressions. AdMeld's webpage in 2010 explained that how it optimized publisher inventory by monitoring publisher sites and selecting "the most lucrative mix of ads across an optimal portfolio of ad networks, exchanges, and DSPs."[730]

580. AdMeld's Commercial Director explained: "When a publisher makes an impression available on our platform, AdMeld issues a bid request, and each bidder must respond within 120 milliseconds. These bids compete not only with one another, but also against other available demand sources (such as ad network tags). Among valid bids that meet the price, advertiser and other criteria of the publisher's business rules, AdMeld picks the winner and redirects to the creative." As a result of its optimization function, AdMeld would move the decision logic away from Google – a threat to the "own-the-tag" strategy.[731] Google had acquired AdMeld that year.[732]

581. Combined with AdX Connect, AdMeld's RTB presented an alternative to DA with an integration where AdX did not have a right of first refusal. After the acquisition, Google had plans to develop a connection between AdX and AdMeld's yield management technology named "AdX Connect." AdX Connect "allows AdX buyer's bids to be pushed into Admeld creating a unified bid landscape for Admeld

[729] GOOG-DOJ-14829208 at -211. "Double Click Ad Exchange All Hands" (undated). Internal presentation.
[730] AdMeld. "Yield Optimization for Premium Publishers" (April 30, 2010). Accessed on May 30, 2024. https://web.archive.org/web/20100430185648/http://www.admeld.com/publishers.html
[731] GOOG-NE- 02111579 at -579. "Re: sale reductions." (March 23, 2009). Internal email thread. ("If we lose platform share, we can build the best GCN in the world but will still be at a severe risk of being disintermediated if Y, M own the ad tag on the publisher page.")
[732] The Washington Post. "Justice Dept. approves Google's AdMeld acquisition" (December 2, 2011). Accessed on June 6, 2024. https://www.washingtonpost.com/business/economy/source-justice-will-approve-googles-admeld-acquisition/2011/12/02/gIQAH8cyKO_story.html ("The Justice Department on Friday gave the green light to Google's $400 million acquisition of AdMeld, a major display advertising company.")

clients."[733] In April 2012, AdX Connect was in Alpha[734] and its Beta was anticipated by end of 2012.[735] Even though Google recognized that "real-time bidding across exchanges: at scale, at the best possible price, with zero waste" would bring value to publishers,[736] AdX Connect was never released and AdMeld was completely turned off by Q3 2013.[737]

582. In Google's implementation of DA, AdX was the only exchange allowed to occupy this privileged position. If publishers could choose which exchange should have the opportunity to bid live on each impression, that would enable the publisher to select the exchange that returned the highest revenue or highest quality ads for them. It would also create the opportunity publishers and exchanges to negotiate for the right of first refusal position; a publisher might negotiate for a lower exchange take rate in return for the position. Of course, this would continue to allow the publisher to provide AdX the right of first refusal and run a version of DA unchanged from that which Google imposed. Thus, allowing publishers to select which exchange should bid live on every impression would have provided additional beneficial choice and would have supported competition between exchanges.

583. In 2015, senior Google managers discussed in an email thread how Google could implement RTB for all exchanges – like Header Bidding does. [redacted] described these alternatives "I realize I'm kind-of describing what DFP is, but without all the special cases between Google products, e.g. "backfill to Adx" becomes "backfill to whatever", or even something more configurable–let them program it. We could even provide a simple declarative language to let them implement their own ordering." In particular, he described how the implementation could take place: "Instead of speculating and doing deep data analyses to try to figure out what's going on behind the scenes with double calls to Adx, for example, we could just run simple queries on configuration database tables. Knowledge is power. (Of course we'd have to win everyone over to this, so maybe this is an innocent idea)."[738]

[733] GOOG-AT-MDL-B-003864327 at -334. "Yield Management Integration" (March 2012). Internal Presentation.
[734] GOOG-AT-MDL-017084371 at -371. "AdX Connect Comms Doc" (March 26, 2012). Internal strategy document. ("The product is currently in Alpha testing with one client.")
[735] GOOG-AT-MDL-004258676 at -729. "Google Yield Management Training for Sales (AdX & Admeld)" (Q2 2012). Internal strategy presentation. ("Currently in early alpha; wider beta/launch end of Q2.")
[736] GOOG-NE-05241137 at -12-13. "Google Display Solutions" (undated). Internal write-up.
[737] GOOG-AT-MDL-B-004279483 at - 492. "Admeld Migration for AdX" (February 13, 2013). Internal presentation. ("AdMeld will be completely turned off in Q3 2013.")
[738] GOOG-AT-MDL-B-001390148 at -149. "Re: Fwd: The Rise Of 'Header Bidding' And The End Of The Publisher Waterfall | AdExchanger" (June 23, 2015). Internal Google email thread.

d) DA allowed AdX to transact more impressions and drove publishers to adopt Header Bidding

584. Around 2014, publishers began to experiment with a new approach to overcome the Waterfall and real-time bidding issues posed by Google. Publishers, other industry participants and even Google saw Header Bidding as a response to Google's DA which preferentially routed inventory to Google's exchange at the expense of publisher yields.

585. In an internal memo, Google senior engineers explained that "Header bidding was developed as a reaction to EDA. HB allows external buyers to compete with DFP line items on the basis of actual CPMs with all other demand in one flat auction at the time of decision making – this was previously only possible for GDN via EDA. The main benefit to publishers from header bidding is increased revenue, due to actual vs. average CPM bid competition in between line items and EDA."[739]

586. Industry participants also linked the rise of Header Bidding to Google's DA. Ryan Christensen, General Manager at AppNexus, stated, "We believe the reason pre-bid is taking off is because of DFP dynamic allocation."[740]

587. The creation of Header Bidding increased head-to-head competition for publishers' ad inventory. The flexibility and features of Header Bidding made it appealing to publishers by providing them with more transparency and control than the Waterfall process and by guaranteeing better yield management. The industry started adopting Header Bidding and departed from DA and sequential calling of exchanges.

588. By 2015, many SSPs and DSPs (such as AppNexus, OpenX, Rubicon, Criteo, Index Exchange, etc.)[741] had Header Bidding implementations that allowed them to bid on publishers' sites. Google remained a notable exception. In a 2015 email thread discussing Google's response to Header Bidding, some employees propose that Google should just please publishers and "allow for all sources of demand to compete fairly, in real-time (or as close to real-time) as possible."[742]

[739] EDA refers to Enhanced Dynamic Allocation, which I discuss later in this section. GOOG-NE-06724126 at -126. "A buy-side perspective on Header Bidding (HB)." (September 2016). Google internal strategy document on Header Bidding.
[740] AdExchanger. "AppNexus Dusts Off Header Bidding Product as Publishers Clamor to Unify Demand" (August 3rd, 2015). Accessed on May 31, 2024. https://www.adexchanger.com/platforms/appnexus-dusts-off-header-bidding-product-as-publishers-clamor-to-unify-demand/
[741] AdExchanger. "AppNexus Dusts Off Header Bidding Product as Publishers Clamor to Unify Demand" (August 3rd, 2015). Accessed on May 31, 2024. https://www.adexchanger.com/platforms/appnexus-dusts-off-header-bidding-product-as-publishers-clamor-to-unify-demand/; Ad Ops Insider. "Header Bidding Implementations in the Wild" (November 16, 2015). Accessed on May 31, 2024. https://www.adopsinsider.com/header-bidding/header-bidding-implementations-in-the-wild/2/
[742] GOOG-TEX-00116076 at -077. "Re: Fwd: The Rise Of 'Header Bidding' And the End Of The Publisher Waterfall | AdExchanger" (June 23, 2015). Internal email thread.

e) Last Look foreclosed demand originating from other exchanges, including Header Bidders, harming publishers

589. DFP does not share the CPM thresholds with other exchanges.[743] No other demand source, including those with a similar RTB technology (e.g., yield managers such as then AdMeld and Pubmatic), had access to rivals' CPM rates specified by publishers.[744] The information provided in the CPM thresholds gives AdX a last look over other demand sources.

590. As RTB became wide-spread and more ad exchanges entered the market, publishers wanted to sell more of their inventory in real time. When publishers started using Header Bidding in 2014,[745] they could, for the first time, solicit real-time bids from multiple ad exchanges at the same time. Soliciting real-time bids from multiple exchanges helped publishers increase their yield.[746] But, because Header Bidding had to be set up in DFP as a remnant line item, DA granted AdX with what was called by the industry as "Last Look" over the Header Bidding – i.e., the Header Bidding bid was communicated by DFP to AdX and used as a floor in the AdX auction.

591. Publishers set up Header Bidding by inserting JavaScript code from a third-party provider into the header of the underlying code on their web pages. This allows a publisher to receive bids from demand sources such as ad exchanges, ad networks, and DSPs for ad inventory available on the publisher's page, even if that inventory has already been sold through a direct buy.[747]

---

[743] An internal strategy document describes sharing a "below third party reserve" rejection code to buyers, which "may confuse buyers since the floor was not sent to them in the bid request". *See* GOOG-NE-13214567 at -572 "Status". (November 30, 2017). Internal presentation
[744] In its deposition, [redacted]. Deposition of [redacted]
[745] Forbes. "Header Bidding 101" (March 2, 2022). Accessed on May 30, 2024. https://www.forbes.com/sites/forbesbusinesscouncil/2022/03/02/header-bidding-101/?sh=472494c51a97 ("The concept of header bidding was first used in 2014".)
[746] Digiday. "WTF is header bidding?" (August 18, 2015). Accessed on May 30, 2024. https://digiday.com/media/wtf-header-bidding/ ("Header bidding, also known as advance bidding or pre-bidding, is an advanced programmatic technique wherein publishers offer inventory to multiple ad exchanges simultaneously before making calls to their ad servers (mostly DoubleClick for Publishers). The idea is that by letting multiple demand sources bid on the same inventory at the same time, publishers increase their yield and make more money.")
[747] "Business Insider. "This new technology is changing web advertising" (March 19, 2016). Business Insider. Accessed on May 30, 2024. https://web.archive.org/web/20160419151111/https://www.businessinsider.com/header-bidding-becomes-popular-among-publishers-2016-3?IR=T ("This code allows chosen demand sources such as ad exchanges, ad networks, or demand side platforms (DSPs) to bid on all the ad inventory available on the page even if that inventory was already sold through direct buys.")

592. Google declined to participate in Header Bidding but publishers could still communicate the winning bids from Header Bidding to DFP by inputting the Header Bidding bid as a static line item.[748]

593. The first step required to serve an incoming impression is for the Header Bidding ad tag (HB Tag) to be placed on the publisher's website to make a request to Header Bidding partners. Then, Header Bidding partners respond with their bids, and that information is passed through the GPT (Google Publisher Tag)[749] to Ad Manager via key values.[750] The GPT also makes an ad request to GAM, which runs DA by selecting the line item that best matches the ad request and calling AdX to run a real-time auction for the impression. AdX returns the winning bid to Ad Manager, which then chooses the best-paying ad to serve.

594. Notably, after the introduction of Header Bidding, DFP could pass the winning Header Bidding bid to AdX as the price floor in its real-time auction.[751] This advantage became known as "Last Look", where AdX "gets to bid with knowledge of the clearing price."[752] According to an internal Google document, "'Last Look' is a term used by our competitors to refer to the way DA works. DA gives AdX the opportunity to compete against all line items in DFP. Before DA calls AdX to run its auction, DFP determines its highest paying line item and passes this as a floor price to AdX. This means line items from directly sold campaigns, Ad networks, other SSPs booked in DFP, and line items activated by Header Bidding can set the floor price of the AdX auction."[753]

595. As Header Bidding gained traction among publishers, Google recognized the competitive threat it posed to AdX. By enabling competing demand sources to circumvent GAM to bid in real-time on a publisher's inventory, Header Bidding eroded the real-time bidding advantage previously afforded only to

[748] GOOG-AT-MDL-001004706 at -759. "Ad Manager Ecosystem 101" (June 2019). Internal presentation introducing the ads ecosystem by gTech. ("GPT makes an ad request to Ad Manager, passing Header Bidding quote into Ad Manager using Key Values.")
[749] Google Ad Manager Help. "Overview of Google Publisher Tag" (undated). Accessed on May 30, 2024. https://support.google.com/admanager/answer/181073?hl=en#:~:text=Google%252520Publisher%252520Tag%252520(GPT)%252520is,the%252520ad%252520on%252520web%252520pages ("Google Publisher Tag (GPT) is an ad tag library that allows publishers to define inventory, initiate and bundle ad requests, and render matching demand. GPT takes key details (such as ad unit code, ad size, and key-values), builds the request, and displays the ad on web pages.")
[750] Key values provide specific targeting information in the form of a key and corresponding value. When an ad request comes in that has key-values in its ad tags, line items that target those key-values are eligible to serve for that ad request. For example, a key may be "gender" and the value could be "female." Key-values, like other targeting, help advertisers and buyers reach their intended audience or demographic. Google Ad Manager Help. "Get started with key-values" (undated). Accessed on May 30, 2024. https://support.google.com/admanager/answer/188092?hl=en
[751] GOOG-TEX-00843142 at -145. "First-price bidding Update" (September 3, 2019). Internal Google Presentation. ("The header bidders are called first and a first-price auction is run amongst them. This is sent as a floor price to AdX".)
[752] GOOG-TEX-00090882 at -882. "GP Product QBR Agenda Outline" (August 2018). Internal strategy document.
[753] GOOG-TEX-00971703 at -723. "Exchange Bidding in Dynamic Allocation (fka Project Jedi)" (March 2017). Google internal communication document; *See also,* GOOG-TEX-00094903 at -903. "Re: EBDA update for print" (March 2017). Google internal email from [redacted] to [redacted], [redacted], and [redacted].

AdX through DFP. A 2018 Google document explained, "when this circumvention is used, Google loses visibility into the "bid stream" (bidding prices on a per-competitor basis), *which are important data points for our own optimization*." (*emphasis* added)[754] This demonstrates Google's intention to create and exploit their information advantage coming from their ownership and design of buy-side tools to steer demand towards AdX by offering opportunities for yield that other exchanges could not replicate without this information.

596. Google's Last Look was designed as part of DA.[755] However, prior to the advent of Header Bidding, AdX floors set via DA were based on the only available and imperfect information to predict third-party demand sources' expected bid: their historical CPM performance.

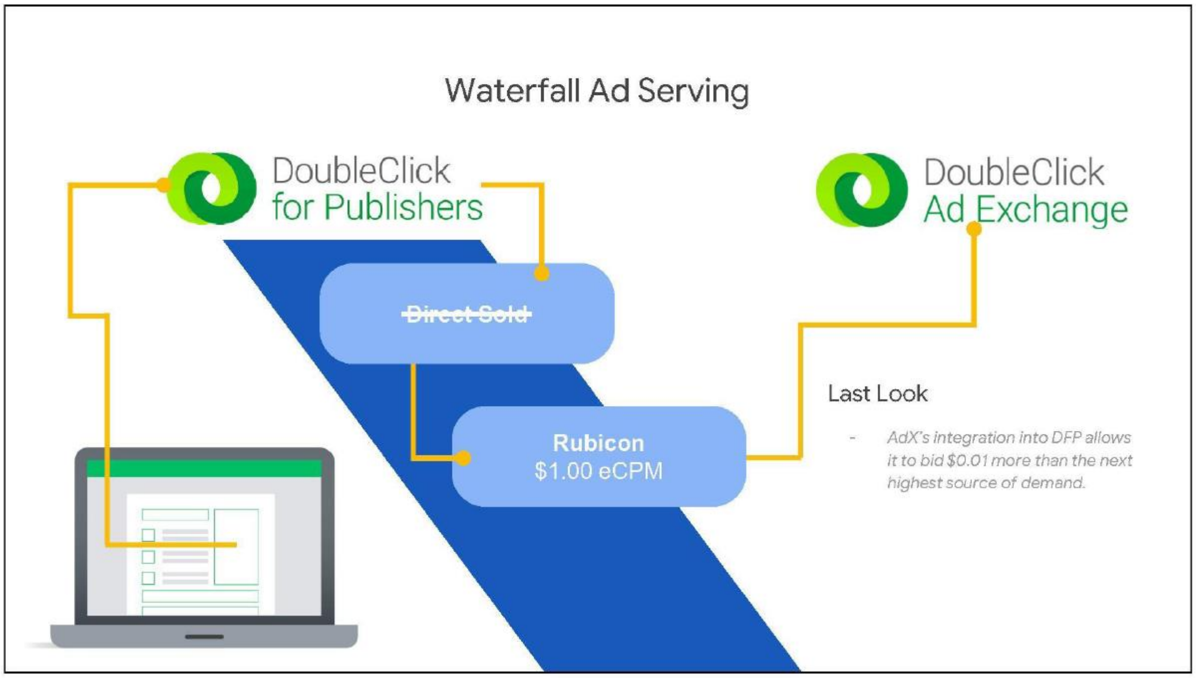
597. Header Bidding bids then provided valuable additional information about buyers' willingness to pay for a specific impression, giving AdX an enhanced advantage via Last Look, and made explicit the missed yield opportunities arising from DA.

598. AdX had the ability to adjust its take rate (i.e., the net bid of its buyers) to win impressions that it would have otherwise lost. In an internal Google presentation, Google described the result of this adjustment as: "AdX's integration into DFP allows it to bid $0.01 more than the next highest source of demand."[756]

[754] GOOG-NE-08116078 at -078. "Existing Headline: Exchange Bidding" (September 2018). Google internal document.
[755] GOOG-AT-MDL-008991406 at -406. "No title" (undated). Google internal document. ("Last Look: Pre-acquisition feature of dynamic allocation").
[756] GOOG-AT-MDL-013987096 at -102. "Publisher Monetization 101" (undated). Internal Google presentation.

Figure 23

Last Look advantage in Waterfall ad serving with DA[757]



599. The same Google presentation, containing the above figure, notes that "[i]n this example, the next highest priority demand source belongs to the Rubicon Ad Exchange, which the publisher has assigned a $1.00 CPM. Because AdX has a direct integration into DFP, it knows that, when it runs its auction, it only needs to beat the publisher's assigned price of $1.00 to win. The AdX auction could result in a $1.01 winning bid or a $101 winning bid. Because the price to beat is $1.00, as long as AdX has an eligible bid, it wins and pays the publisher the requisite $1.01. This process is known as last look, and you can see how this auction mechanic is attractive to buyers who are considering which exchange to work with."[758]

600. Again, employing the previous example, if the highest bid available to AdX was [redacted] but, via DRS, Google implemented a [redacted] take rate, resulting in an effective bid of [redacted], the AdX bid would not clear the minimum required price of [redacted]. However, for the same impression, through DRS, Google had the ability to dynamically adjust its revenue share on this bid to [redacted], resulting in an effective bid of [redacted], which would win the auction.

[757] GOOG-AT-MDL-013987096 at -102. "Publisher Monetization 101" (undated). Internal Google presentation."
[758] GOOG-AT-MDL-013987096 at -102. "Publisher Monetization 101" (undated). Internal Google presentation.

601. Furthermore, DA with Last Look ensured that AdX was the only exchange that submitted a real-time bid. The other sell-side platforms had to rely on publishers to assign an estimate based on historical performance. Publishers had to make trade-offs between operational overhead and efficient allocation of inventory by regularly updating their estimates of historical performance, which meant that AdX's real-time bids competed with inefficient estimates of effective CPM for the other sell-side platforms, further harming competition in the ad exchange market.[759]

602. When Google implemented support for client-side Header Bidding via GAM, it preserved the Last Look advantage through DFP configurations that were designed to favor AdX. Last Look was enabled by the order of the bids solicited by a particular impression. The Header Bidding responses are received before sending the ad request and Header Bidding quote to GAM. This means that not only did Google receive the highest bid from header bidders, but it also allowed bidding tools in the AdX auction to have knowledge of the highest bid from the Header Bidding auction.

603. A Google presentation explains that the highest bid from the Header Bidding auction is used as a floor in the AdX auction, and AdX wins as long as its second-price bid is greater than the highest first-price bid from Header Bidding. [760] As noted earlier, Google, through DRS, could continue to transact impressions it would have otherwise lost by adjusting AdX's take rate to ensure that it clears the floor price from the Header Bidding auction. Google viewed the rise of Header Bidding as a significant threat to its competitive advantage. Header Bidding weakened AdX's advantage of exclusive access to inventory. In a 2017 email, AdX's Global Commercialization Lead stated, "Header Bidding adoption has greatly reduced any inventory exclusivity that AdX once had, as inventory access has become ubiquitous across exchanges. Buyers can find the same inventory through 12+ different exchanges for most top pub."[761]As discussed in Section IX.C, third-party exchanges often have lower take rates than AdX. When competing simultaneously, these exchanges were then able to take advantage of their more competitive net bids leading them to win more inventory.

---

[759] GOOG-AT-MDL-013987096 at -102. "Publisher Monetization 101" (undated). Internal Google presentation. ("However, unlike AdX, which submits a real time bid, the other SSPs rely on the publishers to assign a guesstimate based on historical performance. Because this process is quite manual. Yield Managers typically didn't have time to create nuanced waterfalls that represented the SSP's various demand strengths. Imagine a scenario where App Nexus' large format demand > Rubicon's but it's aggregate demand is not. With only a single waterfall, the publisher can't allocate inventory efficiently across large formats, This is not great for publishers who have to make trade offs between operational overhead and efficient allocation of inventory.")

[760] GOOG-TEX-00843142 at -145. "First-price bidding Update" (September 3, 2019). Internal Google presentation. ("The header bidders are called first and a first-price auction is run amongst them. This is sent to as a floor to AdX").

[761] GOOG-TEX-00095106 at -111. "Re: [For Your Review]: AdX buyer deceleration deck" (May 30, 2017). Google internal email thread.

604. Google introduced Exchange Bidding, a server-side Header Bidding protocol, in response to the competitive threat from Header Bidding. When Google introduced Exchange Bidding, it maintained its Last Look advantage. By concurrently calling the Exchange Bidding and AdX demand sources, bidders in the AdX auction do not have knowledge of the bids coming in from the Exchange Bidding auction. While this gives exchange bidders and AdX bidders a more even playing field, the highest bid from the Header Bidding auction is still passed into GAM to be used as a floor. This enables conduct such as DRS to continue in real time as Google can dynamically adjust AdX take rates to transact impressions it would have otherwise lost. EDA harmed competition in the ad exchange market and reinforced Google's market power in the ad serving market.

3) Google responded to the competitive threat of Header Bidding with EBDA, but maintains DA with Last Look

605. By early 2018,[762] Google responded to the competitive threat of Header Bidding circumventing GAM with its own version of Header Bidding implemented inside the ad server called Exchange Bidding in Dynamic Allocation (EBDA). Google's EBDA was a late implementation of the server-side simultaneous bidding technology AppNexus already offered in 2015.[763] AppNexus called this solution "open dynamic allocation." [764] AppNexus developed this solution in spite of Google's dominance in the ad server market and the switching costs faced by publishers that limited AppNexus' ability to expand its market share. AppNexus' effort demonstrates that publishers wanted the ability to multi-home across exchanges competing on equal footing in real-time.[765]However, as I discuss in Section V.C, publishers face high switching cost in the ad server market. As I discuss in Section VI, publishers also fear losing access to AdX demand. For this reason, the availability of AppNexus' superior alternative to DFP was not sufficient to generate substantial switching.

[762] Google's First Am. Resps. and Objs. to Plaintiff's Third Set of Interrogs. (May 24, 2024) at 11; *See also,* Google Ad Manager. "Exchange Bidding now available to all customers using DoubleClick for Publishers" (April 4, 2018). Accessed on May 30, 2024. https://blog.google/products/admanager/exchange-bidding-now-available-to-a/
[763] App Nexus. "App Nexus Publisher Adserver" (undated). Accessed on May 30, 2024. https://web.archive.org/web/20151107043725/http:/www.appnexus.com/en/publishers/publisher-adserver
[764] App Nexus. "App Nexus Publisher Adserver" (undated). Accessed on May 30, 2024. https://web.archive.org/web/20161119120827/https:/www.appnexus.com/en/publishers/publisher-adserver
[765] AppNexus. "App Nexus + Axel Springer" (undated). Accessed on May 30, 2024. https://www.appnexus.com/sites/default/files/case-studies/Axel-Springer-Case-Study_0.pdf ("But under open dynamic allocation, these rival demand sources were finally able to compete inside the ad server, allowing Media Impact to accept higher programmatic bids and generate superior CPMs whilst ensuring guaranteed campaigns would still achieve their delivery goals.")

606. Google used EBDA to capture third-party demand that had shifted to Header Bidding. With EBDA, GAM introduced a unified auction where third-party exchanges could compete in real time against AdX.[766]

607. With Exchange Bidding, Header Bidding still ran first, and bids from Header Bidding partners were passed through the GPT to the Ad Manager using key values. Then, DA selected the most eligible line item available in DFP, which could be the winning Header Bidding bid and shared that with AdX as a price floor. While AdX ran its real-time auction, DFP also sent a request to Exchange Bidding demand sources, sharing the same price floor given to AdX.[767] DFP received the Exchange Bidding responses and the winning bid from the AdX auction and used those, along with the most eligible line item, to select the winning ad to serve.

608. Although EBDA gave exchanges that participated the ability to compete in real-time with the same price floor information as AdX, it maintained a Last Look advantage over Header Bidding.[768] Prior to this, the highest bid from Header Bidding demand would be used as a floor price in the AdX auction.[769]

4) Last Look increased AdX revenue

609. Google conducted experiments to assess the significance of the "Last Look" advantage before migrating to a first-price auction system. [redacted][770] These findings underscore the critical role played by the "Last Look" advantage, which allowed AdX to access competitor bids until the adoption of first-price auctions in 2019.

---

[766] Google Ad Manager. "Exchange Bidding now available to all customers using DoubleClick for Publishers" (April 4, 2018). Accessed on May 30, 2024. https://blog.google/products/admanager/exchange-bidding-now-available-to-a/ ("With Exchange Bidding, publishers can increase revenue by allowing multiple exchanges to compete with each other -- and with DoubleClick Ad Exchange -- in a unified auction.")
[767] GOOG-TEX-00971703 at -724. "Exchange Bidding in Dynamic Allocation (fka Project Jedi)" (March 2017). Google internal communication document. ("In the initial EBDA design, the bid submitted by an exchange was treated like a price derived from a line item and could become the floor price in the AdX auction. This part of the process was sometimes referred to as "last look")
[768] GOOG-TEX-00843142 at -144. "First-price bidding Update" (September 3, 2019). Internal Google Presentation.
[769] GOOG-AT-MDL-001004706 at -767. "Ad Manager Ecosystem 101" (June 2019). Internal Google gTech presentation introducing the ads ecosystem by gTech. ("GPT makes an ad request to Ad Manager, passing Header Bidding quote into AdManager using Key Values. AdManager picks best direct Line Item based on reserve price")
[770] GOOG-TEX-00682264 at -265. "Re: Unified Auction Changes (Sellside) Executive Update" (August 19, 2019). Internal Google email thread. [redacted].)"

5) Publishers could not easily disable DA to eliminate AdX's right of first refusal

610. Over time, Google offered limited control to publishers over their ability to decide whether to use DA. Google imposed deal terms on some publishers to force the use of DA. A 2012 document mentions that Google imposed strict terms: "The key deal terms include requirements that we are placing on Weather to ensure that we are given the ability to compete on all unsold impressions. These include requiring dynamic allocation, one year SSP/yield management exclusivity, setting for other third-parties equivalent to AdX settings […]."[771] The document further emphasizes that Google has the ability to impose the use of DA: "Q: Requiring dynamic allocation; A: We can; should be no objections."[772]

611. Google also tried to prevent publishers from avoiding DA. Google made DA a default setting of DFP.[773] Some publishers have been able to opt out of the default setting by being made aware of this option and of the potential issues linked to DA: "Eligible-to-compete rate (ETC) refers to % of IAB standard remnant ads that have dynamic allocation runed on divided by total # IAB standard remnant ads ideally ETC should be 100% since dynamic allocation is default opt-in, however some publishers chose to opt-out of dynamic allocation third-party yield management ad servers and competitors will tell publishers to turn off dynamic allocation to get better rates"[774] Google's statement highlights the power of default settings.

612. Publishers could not easily disable DA. In several documents, Google claims that publishers have no control over their choice.[775]

6) DA's revenue-limiting impact is demonstrated by the revenue-enhancing impact of Header Bidding

613. Google recognized that Header Bidding can benefit publishers because it allows them to capture incremental demand.[776] Google understood at least at that time that not all DSPs are integrated with every exchange, and all exchanges, including AdX, can have their unique demand sources due to reasons

[771] GOOG-AT-MDL-019743649 at -943. "PBS Cross-Functional Review Notes (go/pbsxnotes)" (Undated). Internal Google document of meeting notes.
[772] GOOG-AT-MDL-019743649 at -740. "Re: PBS Project Bolt" (Undated). Internal Google document of meeting notes.
[773] GOOG-DOJ-15417377 at -381. "DFP Training Document" (undated). Internal training document. ("A publisher sets up line items for each ad unit, dynamic allocation is enabled by default.")
[774]GOOG-DOJ-15417377 at -382. "DFP Training Document" (undated). Internal training document.
[775] A 2018 internal presentation explains that publishers have "no controls (no op-out)" and that Dynamic Allocation is "fully automated" and "applies to all inventory targeted by Ad Exchange Line Items." GOOG-AT-MDL-004598605 at -614. "Pricing Rules Cards + Yield Management in 2020" (April 2020). Internal presentation. ("DA works its magic in the back-end (no optin/out.").
[776] GOOG-TEX-00105361 at -394. "FAN Bidding in to DRX and AdMob." (April 28, 2017). Internal Google presentation. ("Pros: Universal competition with real-time pricing, captures incremental demand.")

including distinct pricing algorithms, different advertiser policies, buyer preferences, and publisher controls.[777] As Google saw it, there is "quality inventory not available via AdX doors (e.g., some TradeDesk demand)."[778]

614. DA, however, prevented publishers' access to the incremental demand outside of AdX. Publishers need to book CPM rates for all third-party demand sources except AdX, and these CPM rates could be inaccurate. As a result, other exchanges can only compete with AdX at specific price floors for the same impression. This setup limits the ability of unique demand sources on non-AdX exchanges to compete effectively, resulting in missed demand opportunities outside of AdX.

615. DA also restricted publishers' access to the demand outside of AdX and limited their yields because of AdX's priority. If third-party demand sources on alternative exchanges bid higher than AdX for the same impression, optimal results for publishers would involve serving the impression through the third-party source. However, DA grants AdX priority to bid on the impression, and AdX wins as long as the bid surpasses the price floor set by the publisher. This preference over AdX, despite potentially lower bids in AdX compared to third-party sources, denies publishers access to demand beyond AdX and leads to yield loss.

616. The figure below provides an example of how DFP works when there are AdX and two SSPs.[779] In this example, the direct advertisers are sold through the traditional process for a high CPM, so they get prioritized high up in the stack at Standard (Priority 8) at a rate of $9. The guaranteed line items get priority and will serve before AdX if they are booked at Priority 12. In the non-guaranteed ones, AdX competes with two SSPs, where SSP2 is booked at $3 and SSP1 is booked at a lower rate of $1.50. The Waterfall process ensures that the CPMs for SSP2 stay higher than SSP1. AdX has the priority and will be ahead of SSP2 if it has a bid higher than $3. If it does not, then DFP will send every impression to SSP2. If SSP2 does not have bids higher than its price floor, then the impression is further passed to

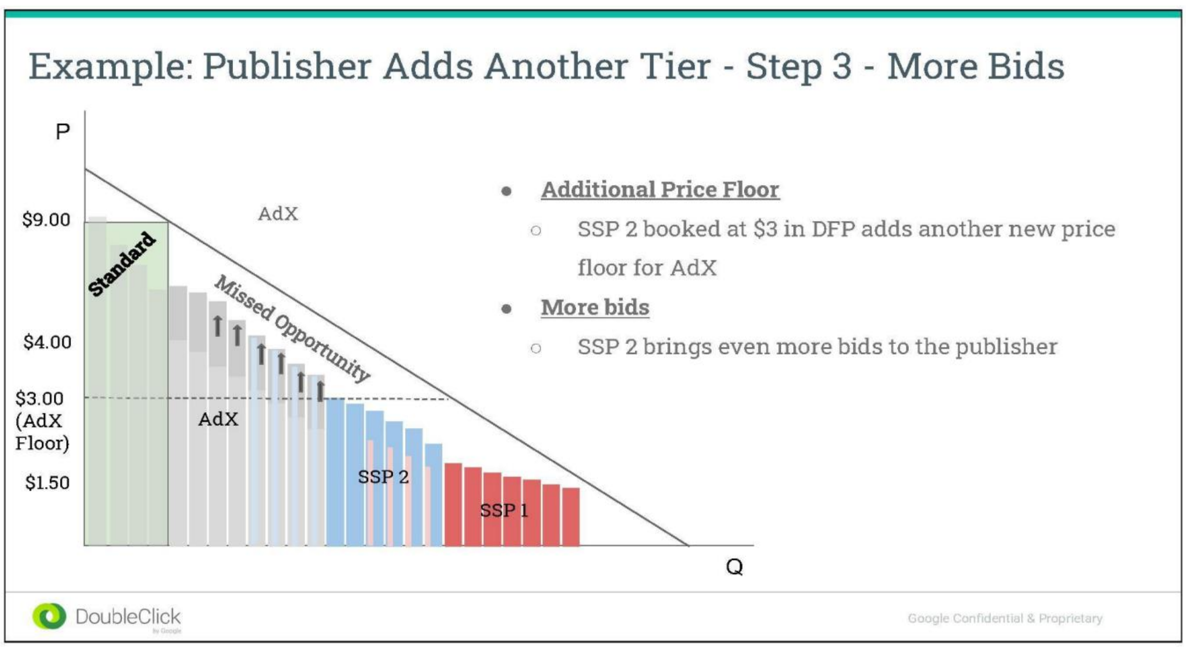
[777] GOOG-DOJ-AT -01811903 at -913. "A buy-side overview to publisher yield: Header Bidding, First Look, and Exchange Bidding" (November 2016). Internal Google presentation. ("There are many potential reasons for unique demand but here are a few common ones: Exchanges have different pricing algorithms which impact the delivered CPM, Exchange advertiser policies can var … Buyers favor certain exchanges because of differences in integration … each exchange offers different controls to block advertisers … exchanges can also give priority treatment for particular pubs for various reasons.")
[778] GOOG-AT-MDL-018463981 at -982. "YouTube/Ad Manager Video 2020 Roadmap" (April 16, 2020). Internal Google email thread.
[779] Note that here SSPs (supply-side platforms) represent exchanges or third-party demand sources. SSP is used to be consistent with the figures from Google.

SSP1. SSP1 ad tags are typically booked directly as the passback in SSP2's system, so the traffic flows directly between these two systems.[780]

617. In the DFP example with AdX and two SSPs, the following figure demonstrates missed opportunities (blank areas under the publishers' demand curve) in DFP. Publishers lose revenue because of two inefficiencies caused by the Waterfall. Firstly, each exchange only competes within one tranche of the chain; for example, AdX only serves if it returns a bid over $3 even though there is a lot of demand below $3. SSP1 only gets the leftover impressions after AdX and SSP2, even though SSP1 has some high-paying campaigns. Secondly, Waterfall has the discrepancy issue when an impression is passed from one system to the next because there is a possibility for impressions to be dropped because of technical glitches or latency. For example, when SSP2 cannot server and has to send the impressions to SSP1, the publisher is taking a loss on a percentage of the traffic.[781]

Figure 24

Transactions in DFP without Header Bidding[782]

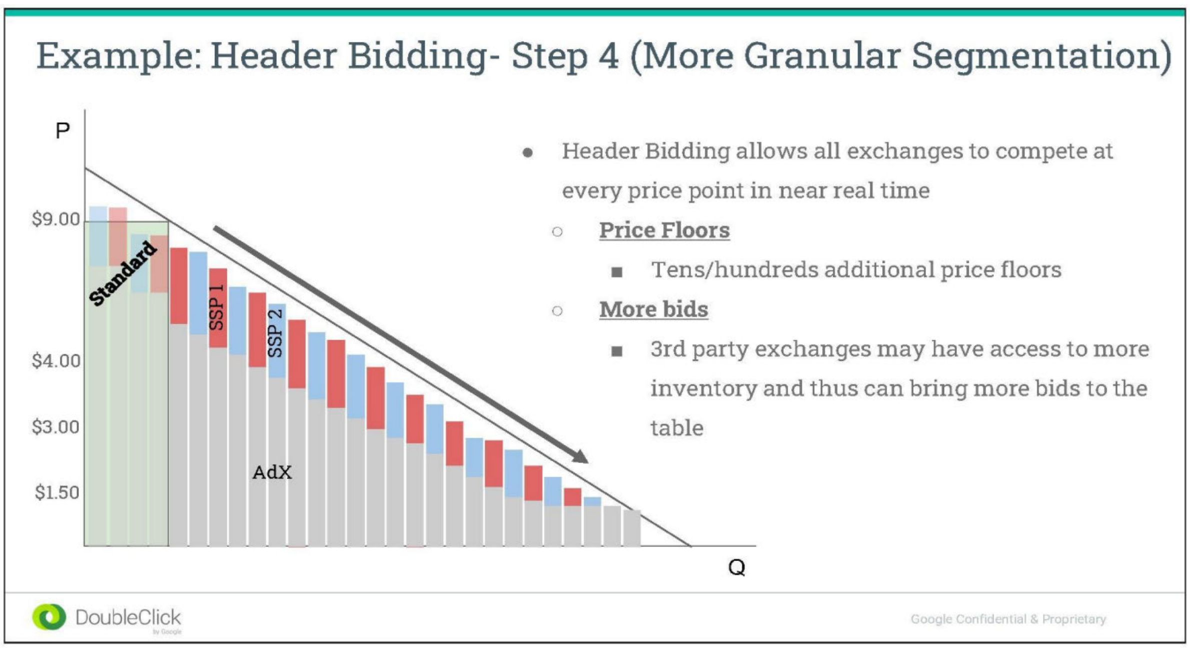


[780] GOOG-DOJ-AT -01811903 at -916-917. "A buy-side overview to publisher yield: Header Bidding, First Look, and Exchange Bidding" (November 2016). Internal Google presentation.
[781] GOOG-DOJ-AT -01811903 at -916-917. "A buy-side overview to publisher yield: Header Bidding, First Look, and Exchange Bidding" (November 2016). Internal Google presentation."
[782]GOOG-DOJ-AT -01811903 at -915. "A buy-side overview to publisher yield: Header Bidding, First Look, and Exchange Bidding" (November 2016). Internal Google presentation."

618. Header Bidding addressed these two issues by allowing AdX and SSPs to compete in near real-time at every price point. The figure below shows that under Header Bidding, SSPs can compete at multiple price points for the same impressions as AdX, and they are no longer stuck within one tranche of the inventory. Header Bidding adds many additional price floors to make the second-price auction similar to a first-price auction, which allows a publisher to close the gap between first and second bids and to increase yield.[783] Each SSP can serve high-paying campaigns to more valuable users, and less valuable campaigns are further down the funnel.[784] So those missed opportunities are captured by Header Bidding, and publishers can benefit from that incremental demand that is not available to AdX. There are more transactions and higher revenue for publishers.

Figure 25

Transactions in DFP with Header Bidding[785]



619. The following evidence shows that Header Bidding indeed raised publishers' revenue. Facebook started offering access to its ad network's demand via Header Bidding, and Amazon launched a Header

[783] GOOG-DOJ-AT -01811903 at -921. "A buy-side overview to publisher yield: Header Bidding, First Look, and Exchange Bidding" (November 2016). Internal Google presentation. ("Header bidding adds tens if not hundreds of additional price floors to make the auctions similar to a first price auction.")
[784] GOOG-DOJ-AT -01811903 at -921. "A buy-side overview to publisher yield: Header Bidding, First Look, and Exchange Bidding" (November 2016). Internal Google presentation. ("Each SSP is able to serve high paying campaign to more valuable users, and less valuable campaigns further down the funnel.")
[785] GOOG-DOJ-AT -01811903 at -921. "A buy-side overview to publisher yield: Header Bidding, First Look, and Exchange Bidding" (November 2016). Internal Google presentation.

Bidding solution giving direct access to its DSP, both in 2017. Facebook launched its ad network Audience Network (FAN) in 2014. FAN allows marketers to buy ads on the open web using Facebook data.[786] In 2016, Facebook began adding a source of demand via HB and claimed that publishers saw a 10% to 30% increase in revenue when integrating Audience Network Header Bidding.[787]

620. Google documents show the positive impacts of Header Bidding in terms of publisher revenue as well as CPM. In a 2015 survey, 6 out of 10 publishers who responded said that Header Bidding had a positive impact between [redacted] on their revenue.[788] In another 2016 survey, 25% of the publishers claimed that Header bidding has a positive impact on revenue between [redacted].[789] The increase in competitiveness due to Header Bidding can also be seen in internal Google analyses, where it was found that eCPM increased by [redacted] due to auction pressure, and external surveys found a [redacted] direct increase in eCPM.[790]

621. An industrial guideline shows that the Header Bidding arrangement has been highly beneficial for publishers, resulting in a revenue growth of 20-50%.[791] Industry participants believe that Header Bidding has paved the way for an unbiased pre-auction for advertisers, ultimately leading to increased competition, higher CPMs, and soaring growth.[792]

622. In 2016, Google also ran an internal experiment to evaluate the revenue uplift of Header Bidding compared to Exchange Bidding for four large publishers.[793] From the experiment, Google found that

---

[786] AdExchanger. "Facebook Ad Stack Still In Flux As More Cuts Come to LiveRail" (April 28, 2016). Accessed on May 31, 2024. https://www.adexchanger.com/ad-exchange-news/facebook-ad-stack-still-flux-cuts-come-liverail/ ("Audience Network acts as an extension to ads sold on Facebook, allowing marketers to buy ads laden with Facebook data, across other publisher sites as well.")

[787] Meta. "Header Bidding for Mobile Web - Facebook Audience Network" (March 17, 2022). Accessed on May 31, 2024. https://www.facebook.com/audiencenetwork/news-and-insights/header-bidding-through-partnerships ("In our tests, publishers who integrated Audience Network header bidding reported increases in revenue of 10%-30%.);AdExchanger. "Facebook Launches Header Bidding, Turns To Partners For the Tech" (March 22, 2017). Accessed on May 31, 2024. https://www.adexchanger.com/publishers/facebook-launches-header-bidding-turns-partners-tech/ ("Facebook claims that publishers see somewhere between 10% and 30% in additional revenue when they integrate Audience Network header bidding.")

[788] GOOG-AT-MDL-008083106 at -107. "Best Yield with DFP Mediation & Header Bidding" (October 2015). Google survey results.

[789] GOOG-TEX-00982498 at -514. "DRX Demand Syndication" (November 2015). Google internal presentation.

[790] GOOG-NE-13384567 at -567. "Re: IAB Header Bidding Survey Stats" (November 7, 2016). Internal email thread.

[791] Ad Pushup. "Header Bidding Explained: How it works and why publishers love it?" (undated). Accessed on May 31, 2024. https://resources.adpushup.com/header-bidding-explained [redacted])

[792] Ad Pushup. "Header Bidding Explained: How it works and why publishers love it?" (undated). Accessed on May 31, 2024. https://resources.com/header-bidding-explained ("It has paved the way for an unbiased pre-auction for advertisers, ultimately leading to increased competition, higher CPMs, and soaring growth.")

[793] GOOG-NE-13215119 at -119,123. Untitled. (August 3, 2016). Internal Google experiment performed on publishers IAC, Vox Media, Hearst, and Trulia to determine revenue uplift from Header Bidding compared to Exchange Bidding. ("As outlined in Exchange Bidding A/B testing guidelines, we will run holdback experiments that drop header bidding key values to measure the revenue impact. We will also run exchange bidding (aka jedi) holdback experiments for comparison purposes.")

Header Bidding "shows an overall uplift of [redacted], while jedi [internal code name for Exchange Bidding] shows a negative lift of [redacted]."

623. A Google strategy document shows that the adoption of Header Bidding amongst publishers in North America grew from [redacted] in April 2016 to more than [redacted] in December 2018.[794] It also shows that throughout 2017, third-party exchanges grew in volume in Header Bidding and Exchange Bidding.[795] [redacted].[796]

624. The impact of Header Bidding on publishers' yields in the long term. For example, Google limited the number of line items and adjusted the data provided to publishers, which affected publishers' control over their inventories and made it harder for them to optimize their revenues. Google has also implemented the UPR. It removed publishers' option to set varied floors for different buying tools and exchanges, further changing their revenue.

625. Senior Google engineers outlined the benefits of Header Bidding to advertisers, showing that DA's negative impact on publishers compared to a system where exchange compete on equal footing (Header Bidding) does not come at the expense of advertiser welfare.[797]

Figure 26

[redacted]

626. Google also thought that Header Bidding offered "more money" to publishers, via universal competition, incremental demand, and avoidance of Google policies and revenue share.[799] Header

---

[794] GOOG-NE-04384116 at -120. "Header Bidding Observatory #3" (Q1 2018). Internal Google presentation.
[795] GOOG-NE-04384116 at -126. "Header Bidding Observatory #3" (Q1 2018). Internal Google presentation "
[796] [redacted] 00804999 at -013. [redacted]
[797] GOOG-DOJ-14431147 at -152. "Buy-side perspective on Header Bidding" (September 2016). Internal Google document describing response to Header Bidding.
[798] [redacted]

Bidding allowed advertisers to "secure access to supply" through a reduced dependence on Google's decision logic, complete user/placement visibility, real-time pricing that increases win rate, rapid innovation, and reduced fees due to avoidance of sell-side revenue shares.[800]

627. One concern during the early implementation phase of Header Bidding was the possibility of duplicated bids or "self-competition" – i.e., the same buyers may submit bids via multiple exchanges leading to "self-competition." A Google document explained that Header Bidding can cause bidders to see lots of excessive QPS (queries per second) because they're getting many callouts per query.[801] However, multiple industrial guidelines on Header Bidding suggested that the industry had realized and addressed the problem of duplicated bids. For example, an industry guide recommended that publishers avoid using too many Header Bidding solutions as this will lead to "duplicate bids".[802] These practical guidelines mitigate the concern that duplicated bids in Header Bidding might negatively affect publishers in the long term. Google also recognizes that participating in Header Bidding is in the best interest of its DBM advertisers and that "self-competition" in Header Bidding is not an issue because "Header Bidding runs a first price auction amongst all bids – so there can be no self competition. Unless in JEDI, where by design the AdX auction competes with header bids."[803]

7) Enhanced Dynamic Allocation harmed competition in the ad exchange market

628. In 2014, Google AdX the ability to compete with guaranteed line items through a program called Enhanced Dynamic Allocation (EDA).[804] Prior to the launch of EDA, AdX did not compete with

[799] GOOG-TEX-00105361 at -394. "FAN Bidding in to DRX and AdMob" (April 28, 2017). Internal Google presentation; The slide titled, "Header bidding benefits pubs and advertisers, challenges DRX," lists pros and cons to publishers and advertisers of Header Bidding.
[800] GOOG-TEX-00105361 at -394. "FAN Bidding in to DRX and AdMob" (April 28, 2017). Internal Google presentation; The slide titled, "Header bidding benefits pubs and advertisers, challenges DRX," lists pros and cons to publishers and advertisers of Header Bidding.
[801] GOOG-DOJ-AT -01811903 at -921. "A buy-side overview to publisher yield: Header Bidding, First Look, and Exchange Bidding" (November 2016). Internal Google presentation. ("Bids oftentimes aren't unique because the same buyers may be participating on multiple SSPs – this can cause bidders to see lots of excessive QPS because they're getting many callouts per query.")
[802] Headerbidding.co. "What is Header Bidding and How Does It Work?" (February 13, 2024). Accessed on May 31, 2024. https://headerbidding.co/header-bidding/#Factors_to_Consider_While_Implementing_Header_Bidding ("With multiple header bidding providers, you risk putting the same impression up for sale to the same buyer on more than one occasion. This will lead to duplicate bids, and the demand for your ad inventories will subsequently decrease.")
[803] GOOG-NE-06724126 at -127. "A buy-side perspective on Header Bidding (HB)." (September 2016). Google internal strategy document on Header Bidding.
[804] Google's First Am. Resps. and Objs. to Plaintiff's Third Set of Interrogs. (May 24, 2024) at 11.

guaranteed line items (direct deals). As I discussed above, guaranteed line items have the highest priority, and if a match is found, AdX will not compete for the impression.[805]

629. In essence, what EDA did is extend AdX's right of first refusal to direct deals. As Google described: "temporary CPM" is an "opportunity cost" of serving an impression with AdX instead of a guaranteed line item.[806] Guaranteed line items typically have a delivery schedule, for instance, to serve 10,000 ads in a time period. The logic of EDA is that the pacing determines the "temporary CPM": if a guaranteed line item is ahead of schedule, then the temporary CPM will be low, but if the line item is behind schedule, then the temporary CPM will be high.[807] In addition, Google states that EDA cannot lead to the under-delivery of guaranteed line items and that temporary CPMs could go as high as 1,000,000 CPM if a line item were behind schedule.[808]

630. As I explained above, EDA enables AdX (and only AdX) to transact impressions that would have been allocated to direct deals if it results in a higher clearing price. More specifically, AdX was given the ability to use the highest valued line item price as its reserve price, and transact the impression if it can beat this reserve price. No other exchange has this ability. AdX's privilege under EDA hams the competition in the ad exchange market in the long run.

631. EDA increases AdX revenue and win rate. The AdX win rate increases because only AdX can transact these valuable impressions. AdX revenue also increases because (a) it transacts more impressions, and (b) these new impressions are relatively high valued and expensive. Since AdX makes money by taking a share of the auction clearing price, this also adds to the revenue increase of AdX.

632. In the long run, AdX's unique ability to trade high-value impressions makes it more appealing to advertisers compared to other exchanges. Without EDA, advertisers need to purchase high-value line items in bulk via direct deals, meaning they have to make commitments to buy high-value impressions at a large scale. This is both an expensive and a time-consuming task that is not viable for many advertisers, especially small ones. With EDA, they can purchase these impressions one at a time, allowing them

[805] GOOG-NE-11926658 at -707. "Display Ecosystem Boot Camp" (undated). Internal presentation from DoubleClick Ad Exchange by Google. ("Guaranteed inventory: Directly-booked deals with impression goals and campaign flight dates. Remnant/Preemptible inventory: Ad networks, yield managers and other remnant solutions.")
[806] GOOG-TEX-00082986 at -986. "Enhanced Dynamic Allocation V3: Giving more controls to publishers." (undated). Google internal design document. ("To control delivery of reserved ads, the opportunity cost of not serving the winner of GFP is computed".)
[807] GOOG-NE-13203009 at -016. "DRX Global Optimization of DRS, RPO, and EDA." (undated). Internal Google presentation. ("EDA-reserve = Max (Opportunity-cost(a*), Max-remnant")
[808] GOOG-TEX-00082986 at 986. "Enhanced Dynamic Allocation V3: Giving more controls to publishers." (undated). Google internal design document. ("In the previous implementation, the eda_price could be too high (as high as 1,000,000 cpm) if the reserved ad is behind its schedule.")

greater flexibility. Since DFP gives AdX a right of first refusal to trade high-value impressions, EDA gave AdX an advantage.

633. With EDA, Google exposes all guaranteed inventory to AdX.[809] Google states there is no delivery risk with EDA, as EDA will create high temporary CPMs when guaranteed line items are behind schedule.[810] Google touted this program as a way for publishers to increase yield by introducing a threshold below the EDA temporary CPM and above the guaranteed line item price.[811]

C. Google restricted publishers' use of line items in order to suppress the adoption of Header Bidding

634. The third way in which Google impaired the use of its ad server products was by imposing restrictions on "line items" to limit the use of Header Bidding by publishers. Line items were ad server settings that publishers used in order to customize their ad servers, most notably to enable Header Bidding. As explained previously, Header Bidding was a key facilitator of competition for the inventory between AdX and third-party exchanges. Google imposed restrictions on the number of line items publishers could use ("line item caps"), in an effort to limit the adoption of Header Bidding.

635. In this section, I present my analysis of the effects of Google's line item caps. I find that: (a) Google's monopoly power in the ad server market gave it the ability to impose restrictions on line items, and (b) Google's vertical integration between the ad server and exchange market gave it the incentive to impose restrictions to favor AdX. In the absence of either monopoly power or vertical integration, Google would have been compelled by competitive forces to develop and maintain product features that gave publishers the most value. More specifically, facilitating competition in the adjacent ad exchange market would have been a profit-maximizing strategy for Google if it considered solely the ad server market, as this competition would have generated more value for publishers, from which Google could have then benefited through ad server sales. However, Google's vertically integrated ad server and exchange businesses changed its incentives; it did not prioritize maximizing profit in the ad server market but rather sought to leverage its power in the ad server market and degrade its services to publishers in order to advantage itself in the exchange market. Instead of facilitating competition in the ad exchange market and

[809] GOOG-AT-MDL-004288583 at 592. "Yield Management in Google Ad Manager" (July 2018). Internal Google presentation. ("Expose to AdX all inventory that you choose to sell programmatically by targeting it on AdX Line Items; this wil enable Dynamic Allocation (DA).")
[810] GOOG-TEX-00082986 at -986. "Enhanced Dynamic Allocation V3" (undated). Google internal design document. ("In EDA V3, we suggest that the eda_price should not exceed a cap even if the reserved ad is behind its schedule.")
[811] GOOG-AT-MDL-004232442 at -447. "Increased Overall Yield with Optimized Competition (BETA)" (undated). Internal Google presentation. ("The chosen floor is always at least as great as the line item CPM of the competing line item and at least as great as any applicable AdX open auction pricing rule.")

providing more value to publishers, Google imposed restrictions on line items, which degraded the value to publishers in the ad server market and significantly reduced competition in the ad exchange market.

636. I am unaware of an explanation of how line items restrictions can be procompetitive or in publisher interests. If Google suggests procompetitive benefits, I plan to evaluate such claims.

637. In the remainder of this section, I explain Google's conduct and intentions with respect to line item caps and the resulting anticompetitive effects.

1) Functioning of line item caps

638. A Header Bidding auction takes place on the website visitor's browser as the page loads and the winning bid is then relayed to the publisher ad server to complete the ad-serving process. Successful communication between the publisher ad server and the Header Bidding auction requires the use of "line items."[812] In the most basic sense, line items are ad server settings, specified by the publisher, that specify all of the details relevant to showing an ad to website visitors, including the space available for the ad and the details about what kind of ad campaign could be shown. Line items are also used to translate the bid values from the Header Bidding auction into values the ad server can recognize. Line item values take on a value of 1 (corresponding to a true or valid value) or 0 (where the value is false or invalid). For example, a $2.00 bid will translate into a value of 1 for a line item corresponding to a $2.00 bid on the publisher ad server. Then, the $2.00 line item will be processed on the publisher ad server.

639. The publisher must specify each line item for the ad server.[813] Thus, if a publisher expects bids to fall between a range of $0.01 and $20.00 and wants line items available in increments of $0.01, the ad server owner needs to setup thousands of individual line items established on the publisher ad server.[814] This was time consuming and required specialized technical knowledge do to. Managing this today remains time intensive and complex.[815]

640. Publishers' benefit from a high granularity when setting up line items. If a publisher sets line items from $1 to $10 in $1 increments, it would interpret a bid for $1.99 as $1 and hence end up selling

[812] Prebid. "Introduction to Header Bidding" (undated). Accessed on June 2, 2024. https://docs.prebid.org/overview/intro-to-header-bidding.html ("[...] need to set up line items within the ad server for all ad units that are part of the header bidding auction.").
[813] Prebid. "Introduction to Header Bidding" (undated). Accessed on June 2, 2024. https://docs.prebid.org/overview/intro-to-header-bidding.html
[814] Search Engine Journal. "What is Header Bidding And How To Implement It" (December 22, 2022). Accessed on June 2, 2024. https://www.searchenginejournal.com/header-bidding/389013/#close ("you would need to build line items in GAM with certain granularity, say 0.01 – and for the CPM range $0-$20, you would need to create 2,000 line items, which are impossible to do manually.").
[815] Conversation with Prof. John Chandler, June 4th, 2024.

ad space for $1 rather than $1.99, reducing its payout by almost half. On a large scale, this can significantly reduce publishers' yield. For this reason, many third-party services that help publishers implement Header Bidding offer products with "penny-specific price granularity."[816]

a) Google imposes caps on the use of line items

641. Despite the requirements from publishers for tens if not hundreds of thousands of line items, for Header Bidding and granular revenue management, Google Ad Manager caps the number of line items a publisher can use. Consequently, the need to setup a large number of line items and Google's caps on them have been the source of many challenges for publishers who want to integrate Header Bidding with Google Ad Manager.

642. While certain documents suggest that publishers have up to 1,000,010 line items available to them,[817] the reality is that the limit is 61,000. [818]

643. These limits have resulted in publisher complaints and challenges. A 2018 Google document claims that a publisher had to reduce the "pricing granularity of their Int header bidding line items to get back to being under the 61,000 limit, but claim it is having a revenue impact."[819]

644. These limits also impacted publisher ability to adequately measure and report advertising returns. A Google employee notes that it "sounds like reporting is the perceived gap" for publishers thinking about decreasing their line item count.[820] The Washington Post explicitly told Google that the granularity of reporting was a reason for them to set up additional line items. An employee recounts: "they need the granular reporting it provides and it ensures a 'smooth yield curve' which is important to their business. They did say that if Google could come up with a solution for HB LI granularity while still providing granular reporting, they would be willing to test any betas."[821] Another sales representative explains: "one

[816] AdExchanger. "AppNexus Dusts Off Header Bidding Product as Publishers Clamor To Unify Demand" (August 3, 2015). Accessed on June 2, 2024. https://www.adexchanger.com/platforms/appnexus-dusts-off-header-bidding-product-as-publishers-clamor-to-unify-demand/ ("According to Ropelato, about half of the header bidding partners Purch works with create penny-specific price granularity, including AppNexus.").
[817] GOOG-DOJ-14656685 at -686. "Re: [URGENT: CBS IS STILL ADDING ACTIVE LINE ITEMS]" (April 3, 2017). Internal email thread between [redacted], [redacted], [redacted], and other. ("We have communicated to CBS that total line item limits (currently 1,000,010) will not be increased until everyone agrees to proposed plan.")
[818] Google Ad Manager Help. "System maximums and limits" (undated). Accessed on June 2, 2024. https://support.google.com/admanager/answer/1628457?hl=en ("Active line items and creatives with targeting: 61,000.").
[819] GOOG-TEX-00090969 at -972. "Re: Ultraprio - Increase the ALI for Turner" (September 26, 2018). Internal email thread with [redacted], [redacted], [redacted], [redacted], and others.
[820] GOOG-AT-MDL-004483910 at -912. "Fwd: [URGENT: CBS IS STILL ADDING ACTIVE LINE ITEMS]." Internal email thread with [redacted], [redacted] [redacted], [redacted] on CBS requesting additional line items.
[821] GOOG-DOJ-32022633 at -638. "Re: FORK: ALI thread for Washington Post" (October 8, 2018). Internal Google email thread on an increase request for active line items for Washington Post with [redacted], [redacted], [redacted], [redacted]

of the main reasons WaPo's setup (specifically the $0.01 increment by LI) is because of a reporting need."[822]

645. Most publishers who face challenges with line item limits imposed by Google tend to be larger publishers with elaborate advertising sales strategies and complex Header Bidding set-ups.[823]

b) Google had an anticompetitive motive, and the technical justifications it gave were pretextual

646. Google's motive in imposing limits to the number of line items available to publishers, and denying requests for those limits to be raised, was to restrict competition in the ad exchange market by making Header Bidding more difficult and costly to the largest and most important publishers. While Google offered various technical explanations for the caps, these were pretextual. Specifically, the intensive line item usage from Header Bidding presented limited costs to Google's ad server. The addition of line items only presented ad-serving costs to Google in certain circumstances. In this section, I present evidence demonstrating the pretext of Google's justification and its true anticompetitive motives.

647. The increase in *active* line items rather than total line items seems to be the constraint on serving[824] Google communications make clear that the true motives for limiting line items was to prevent Header Bidding, rather than technical costs. A 2017 email explains that Google needs to "figure out the real hard limit."[825] Google does not seem to have a clear understanding of the cost to its systems from increasing the number of line items.

[redacted] [redacted], Nitish Korula, [redacted], [redacted], [redacted], [redacted], [redacted], [redacted], [redacted], [redacted] [redacted], [redacted] [redacted], [redacted].

822 GOOG-DOJ-32022633 at -637. "Re: FORK: ALI thread for Washington Post" (October 8, 2018). Internal Google email thread on an increase request for active line items for Washington Post with [redacted], [redacted], [redacted], [redacted] [redacted], Nitish Korula, [redacted], [redacted], [redacted], [redacted], [redacted], [redacted], [redacted], [redacted] [redacted], [redacted] [redacted], [redacted].

823 GOOG-TEX-00090969 at -970. "Re: Ultraprio - Increase the ALI for Turner" (September 26, 2018). Internal email thread with [redacted], [redacted], [redacted], [redacted], and others. ("we h[a]ve seen growth in inventory complexity (Steadily) for >2 years. This required us to refactor our serving infrastructure for retrieving LI/CLT. […] In the last 6 months we have had 2 new classes of escalations withing serving that are linked to these increasingly large and complex pub setups.").

824 GOOG-DOJ-15442474 at -479, -476. "Re: [URGENT]: CBS hit their total line item limit" (March 29, 2017). Internal Google email thread on CBS hitting their line item limit with [redacted], [redacted], [redacted], [redacted], [redacted], [redacted] and others. ("Serving cares more about a total number of active line items. As long as that is still under control with this new increase, we have no objections."; "My understanding from the original Limit documents that were shared with me is that there is no technical limit on how high we can increase Total Line Item – e.g. that is does not stress the system in the same way as Active Line Items"; "Non-active line items don't stress ad-serving or IM/F but they would stress Frontend, API and reporting.").

825 GOOG-DOJ-15442474 at -476. "Re: [URGENT]: CBS hit their total line item limit" (March 29, 2017). Internal Google email thread on CBS hitting their line item limit with [redacted], [redacted], [redacted], [redacted], [redacted], [redacted] and others. ("After all the discussion, if we decide this is a valid use-case that we must support, we may need to figure out the real hard limit and also a way to potentially hard delete some line items when that limit is reached, or some other creative way to deal with this.").

648. Instead of granting publishers' requests, Google used line item limitations as a way to make Exchange Bidding more attractive.[826]

649. In 2018, Google employees again explained their methods to limit Header Bidding. In a 2018 email exchange, it seems that the costs for Google of doing so are limited ("(some) cost on us") and that resources can be saved some other ways ("purging active LI that aren't really active is something we should do anyway").[827]

650. Similarly, a 2019 Google email discussing a limit increase for The Washington Post mentions that Google can accommodate the increase.[828] Google's refusal relies more on preventing the publisher from deploying its Header Bidding strategy.

651. Google only partially provided publishers with more line items via exceptions. In August 2018, Google launched a new process for publishers to request line item limit exceptions.[829] Google notes that requesting an exception does not guarantee a publisher access to more line items. Google declined many publishers' access to additional line items despite its ability to do so (see Section VII.C.3).

652. A 2020 Google document detailed how Google evaluates line item limit exception requests.[830] The document highlights that all line items with a zero rate and no Value CPM or that are excluded from

[826] GOOG-DOJ-15442474 at -474. "Re: [URGENT]: CBS hit their total line item limit" (March 29, 2017). Internal Google email thread on CBS hitting their line item limit with [redacted], [redacted] and others. ("We've had a number of pubs come to us with requests for exceptions on the number of active LI in their setups, in order to support Header Bidding. I'd like to get out in front of this avalanche, and suggest that we have a more formal policy for proactively reaching out to pubs, and turning down escalated requests for exceptions. As part of the effort, I'd like us to offer Exchange Bidding as an alternative.")

[827] GOOG-DOJ-15127000 at -000, -001. "Re: ALI limits/ fee" (October 8, 2018). Internal Google email thread on the limit of active line items with [redacted]. ("I agree that we won't make much money from charging an extra serving fee, but we're not necessarily doing this for profitability. We want to give publishers a reason to actually think about whether this makes sense, and make a conscious tradeoff: If we don't, if a publisher makes even [redacted] more HB revenue, why wouldn't they do it?" […] "That's a much better world for us than one in which we subsidize them doing something that honestly may not give them that much revenue, but does impose some cost on us, and which they wouldn't even view as a tradeoff.")

[828] GOOG-DOJ-32022633 at -633. "Re: FORK: ALI thread for Washington Post" (October 8, 2018). Internal Google email thread on an increase request for active line items for Washington Post with [redacted], [redacted]. ("We can support additional 20K for WaPo. We can go higher than that, it's only compute resources, after all.").

[829] GOOG-AT-MDL-001044707 at -708. "Weekly GTM Product Updates Newsletter" (August 28, 2018). Internal email newsletter on features go to market and bug fixes. ("Line Items Limits Exceptions: New Escalation Path; Description: We've launched a new process for requesting limits exceptions through go/limits-escalation.").

[830] GOOG-AT-MDL-001401925 at -926. "Limits on the use of line items - Exception criteria and process" (May 5, 2020). Internal Google document on limits on line items. ("If your publisher requested an exception to the Limits on the use of line items: 1. Make sure your publisher's use case is eligible for an exception, by reviewing the line item use cases tables above. […] 2. Access the amendment in MOCA+ under the name "Ad Manager Line Items Amendment" […] 3. Explain why an exception is applicable […] 4. If approved, you may send the amendment to the applicable publisher.").

price competition are excluded from receiving a line item limit exception. Exceptions are meant to be rare; the document emphasizes: "Please do NOT bring up or discuss exceptions proactively with your publishers."[831]

653. Google wanted to keep these line item limit exceptions confidential to facilitate its denial of future requests.[832]

654. As described in Section VII.C.3, despite the processes in place and its technical capabilities, Google denied many line item limit exception requests to publishers.

655. Other ad servers that did not benefit from a dominant market position promoted technological innovation to facilitate the use of Header Bidding. In 2016, OpenX launched a new line item capability enabling publishers to manage their Header Bidding setup via a single lie-item rather than multiple.[833]

656. Google's monopoly power allowed it to avoid competing on the basis of innovation and higher-demand products. Instead of increasing line items or innovating to provide a single line item solution like OpenX, Google was able to deter publishers from using Header Bidding.

657. Instead of increasing its line item limit, Google started enrolling publishers requesting additional line items into its Header Bidding Manager (HBM) tool in 2021. HBM was a solution that responded to the settlement between Google and the French Competition Authority and enabled publishers to set up the Prebid wrapper via Yield Groups.[834] With HBM, publishers no longer had to set up hundreds of line items for Prebid and could instead install Header Bidding via Yield Groups, similar to Open Bidding Yield Groups.[835] Standard ad serving fees are applied to Header Bidding impressions transacted via Yield

[831] GOOG-AT-MDL-001401925 at -925. "Limits on the use of line items - Exception criteria and process" (May 5, 2020). Internal Google document on limits on line items.
[832] GOOG-NE-11810332 at -333, -332. "Re: Ultraprio - Increase the LAI for Turner" (September 25, 2018). Internal email thread on line item request for publisher Turner. ("[Turner is] aware of another publisher that has been granted an increased ALI limit, which would make the rejection harder for them to accept […]"; "the comment that Turner wants more because we've granted to others is the problem.")
[833] OpenX. "OpenX Launched Header Bidding Line Item Capability for Ad Server Clients" (August 15, 2016). Accessed on June 2, 2024. https://www.openx.com/press-releases/press-openx-launches-header-bidding-line-item-capability-for-ad-server-clients/ ("OpenX, a global leader in driving superior monetization for publishers, today announced the launch of the industry's first header bidding line item capability for ad serving.")
[834] French Competition Authority. "Commitments offered by Google under Article L.464-2, III of the French Commercial Code" pg. 3 (February 15, 2021). https://www.autoritedelaconcurrence.fr/sites/default/files/attachments/2021-07/21-d-11_ven.pdf
[835] Google Ad Manager. "Improved header bidding support in Google Ad Manager" (April 27, 2022). Accessed on June 5, 2024. https://www.autoritedelaconcurrence.fr/sites/default/files/commitments/2021-08/google_committments_english_version_21d11.pdf ("The current process to set up header bidding can be resource-heavy and time consuming, requiring publishers to set up and manage hundreds to thousands of line items and ad creatives. To simplify this, we've developed a new way for publishers to set up header bidding through yield groups. In just a few steps, publishers can make their ad space available to header bidders — similar to how they can specify what ad space they want to sell with Ad Exchange or Open Bidding.")

Groups.[836] In June 2022, Google notes that HBM had been adopted by 59 publishers, leading to $17M ARR via Header Bidding Yield Group.[837]

658. However, HBM did not fully solve the issue of publishers requesting line item limit exceptions as it had limited functionality. HBM only worked with the Prebid wrapper and GPT tags, and as of March 2023, not all Header Bidding Ad Networks were supported by HBM. It only applies to certain types of ads.[838] HBM provided limited control in the user interface when it first launched.[839] HBM, also referred to as Banksy internally,[840] was more similar to an OB solution and did not provide publishers with a unique set of features. Google notes that when pitching HBM to publishers, around 50% of them mentioned that they knew or had already used similar products, such as Magnite's Demand Manager product.[841] Moreover, HBM adoption was slow as it was available in GAM 360 only[842] and remained confidential as only a couple of publishers were progressively enrolled. Moreover, Google tried to keep HBM confidential but was noticed by some bidders.[843]

659. To summarize, Header Bidding increased the need for publishers to use additional line items. As part of a concerted effort to limit Header Bidding, which Google saw as a threat to its ad exchange business, Google undertook efforts to deny requests for additional line items. While pretextual technical

[836] GOOG-AT-MDL-006233134 at -135. "Header bidding yield groups - Set-up guide" (April 25, 2022). Internal Google document on Header Bidding Yield Groups. ("Publisher fees: Standard ad serving fees will apply to header bidding impressions transacted via yield groups.").
[837] GOOG-AT-MDL-007238619 at -629. "Header Bidding Yield Groups - Weekly Sync Notes". Internal Google document regrouping meeting notes on Header Bidding Yield Groups. ("Adoption (go/hbm-dash) as of 6/26: 59 pubs live, ~$17M ARR via HBYG.").
[838] AdExchanger. "Google Ad Manager Builds A Bridge To Prebid - But Don't Call It A Two-Way Street" (April 27, 2022). Accessed on June 2, 2024. https://www.adexchanger.com/platforms/google-ad-manager-builds-a-bridge-to-prebid-but-dont-call-it-a-two-way-street/?utm_medium=email&_hsmi=221445771&_hsenc=p2ANqtz--4xMXd0nYZgySiGl8J7MUeIys6-NNgM74eMd3Xu5YDZTJYXIL7ECbov95hR-FalT7JDgQ0ICFJ9_ZI9MBlSgTyelHHlqEP5_gGY08zN5s9-jUpYug&utm_content=221445771&utm_source=hs_email ("The changes apply to web display, where header bidding is concentrated, but not apps or video."); *See also* GOOG-AT-MDL-006233134 at -136. "Header bidding yield groups - Set-up guide" (April 25, 2022). Internal Google document on Header Bidding Yield Groups. ("Format/inventory support limited to banner web.").
[839] GOOG-AT-MDL-006233134 at -136. "Header bidding yield groups - Set-up guide" (April 25, 2022). Internal Google document on Header Bidding Yield Groups. ("No control is currently available in the UI to specify the desired SafeFrame rendering behavior.").
[840] GOOG-AT-MDL-009009231 at -231. "Steve Swan" (September 7, 2021). Internal document regrouping a Google employee's accomplishments. ("Banksy: Overall responsible for Header Bidding Manager.").
[841] GOOG-AT-MDL-008900801 at -819. "PubTags Intro" (Fall 2021). Internal Google PowerPoint on Header Bidding Manager. ("Across the 20 publishers pitched, close to half mentioned familiarity or use of Magnite's Demand Manager product (including "microwrappers").").
[842] Google Ad Manager Help. "Header bidding trafficking" (undated). Accessed on June 2, 2024. https://support.google.com/admanager/answer/12273163?hl=en_ ("Only available in Google Ad Manager 360").
[843] GOOG-AT-MDL-001462938 at -940. "Re: [Time Sesitive] possible HBM leak" (April 12, 2022). Internal email thread on HBM between [redacted] and others. ("Orange (French HBM pilot publisher) moved 100% of their traffic to header bidding yield groups this week. They were just contacted by Criteo who noticed a sharp drop in their price priority line items; while HBM is not supposed to be noticeable by differs, it appears Criteo regularly runs GAM reports […] We asked Orange to gain some time, but I expect Criteo may soon realize their header bidding traffic has shifted to yield groups and may start asking more questions.")

reasons were given, its true motives were anticompetitive and technical constraints were negligible. Google did not increase its line item limit but implemented a process for account managers to request a limit exception. This process was kept confidential, and account managers were prohibited from proactively communicating it to publishers. As described in more detail in Section VII.C.3, Google often denied limit exceptions to publishers, removing publishers' ability to control their Header Bidding strategies and even leading to a potential decrease in publisher yield. As part of its settlement with the FCA, Google committed to developing its Header Bidding Manager tool. However, HBM only partly satisfied publishers' needs and ability to expand their Header Bidding strategies.

2) Google's line item caps harmed competition in the ad exchange market

660. This section explains how Google's restrictions on line items harmed competition in the ad exchange market.

661. Google's limitations on line items restricted competition from Header Bidding exchanges. Google's DFP ad server requires publishers to match a bid received from a Header Bidding exchange with a price corresponding to a pre-existing ad server line item. If a publisher receives a bid of $5.20 from an exchange using Header Bidding, but the publisher only has a pre-existing line item with a price of $5, then Google's ad server rounds down the Header Bidding bid to the line item with the next closest price (in this case, $5). The publisher must then create a large number of line items to capture prices corresponding as closely as possible to what Header Bidding bids might be. Google's ad exchange is not subject to these line item needs. By capping the number of line items publishers can set, Google's ad server then artificially limits the competitiveness of Header Bidding exchanges compared to its own ad exchange, impairing price competition in the ad exchange market.

3) Google's line item caps harmed publisher yield

662. In his deposition, Korula acknowledges that increasing line item limits could increase revenue for publishers. When asked about a 2017 email in which he stated that "given that the whole escalation is about how HB competes with AdX, anything that we do to help is necessarily going to increase HB

revenue,"[844] Korula says that "it could increase header bidding revenue, but it also might not have been material."[845]

663. Google's restrictions on line items decreased publishers' yield. Indeed, Header Bidding affects direct sales. Google acknowledges that not increasing line item limits "would affect high value direct sales."[846] Using Header Bidding also enabled publishers to access a different type of demand, especially Amazon demand. A 2018 email states that a publisher is "using Exchange Bidding, but main reason they still use HB is access to other demand (like Amazon)" and "in their experience, they make more money using both EB and HB together."[847] Granularity, and thus the number of line items, plays a role in a publisher's ability to monetize its inventory. The email states that a publisher "has reduced the pricing granularity of their Int header bidding line items to get back to being under the 61K limit but claim is having a revenue impact."[848]

664. However, it is important to note that yield is not the sole factor for publishers using Header Bidding. For instance, publishers can decide to use Header Bidding to be less reliant on Google as a diversification strategy. Therefore, any attempt by Google to justify line item increase refusal as being profit-maximizing for publishers completely omits the different reasons why publishers might use Header Bidding. Line item caps guarantee Google's control over inventory at the same time as it abolishes publishers' control over that inventory.

665. The publisher, CBS Interactive, was harmed by Google's decision not to provide additional line items, although it was feasible for Google to do so.[849] In this email thread, Google acknowledges that not granting this line item request would harm CBS' monetization.[850]

---

[844] GOOG-TEX-00084837 at -837. "Re: Potentially raising LI limits for Daily Mail" (December 12, 2017). Internal Google email thread on increasing line item limits for Daily mail with [redacted], [redacted].

[845] Deposition of [redacted] (Engineering Director, Google), 222:17-222:24. November 3, 2023. ("Q. So increasing a line item cap would increase HB revenue? A. Not necessarily, I suppose. And now I don't know why I use the word "necessarily" here in this document. But, yeah, I mean, I think, it could increase header bidding revenue, but it also might not have been material.")

[846] GOOG-TEX-00090969 at -972. "Re: Ultraprio - Increase the ALI for Turner" (September 26, 2018). Internal email thread with [redacted], and others. ("Although [the publisher Turner]'ve been able to get just below the limit (through less than ideal measures described above) the concern is that they will hit the limit again, which will prevent new line items from being created. This would affect high value direct sales.").

[847] GOOG-TEX-00090969 at -969. "Re: Ultraprio - Increase the ALI for Turner" (September 26, 2018). Internal email thread with [redacted], and others. ("They do use EB for Index and Rubicon, but in their experience, they make more money using both EB and HB together.").

[848] GOOG-TEX-00090969 at -972. "Re: Ultraprio - Increase the ALI for Turner" (September 26, 2018). Internal email thread with [redacted] and others.

[849] GOOG-TEX-00209387 at -388. "Re: Ultra prio request for CBS - May 1st" (May 1, 2018). Internal Google email thread on line item limit exception for CBS with [redacted]

666. Despite acknowledging that Google's restriction on line items will harm CBS' yield and stating that it could technically accommodate this request, Google decided not to grant CBS the request, as a big decision to limit CBS expansion of Header Bidding.[851]

667. Similarly, Walmart also suffered from line item restrictions. A 2021 email from Walmart complains that Walmart was facing "under pacing" issues despite a forecast showing "plenty of inventory".[852] As its account manager did not provide a response, Walmart escalated the issue, emphasizing that it was a "big deal."[853]

668. Google acknowledged that Walmart's issue was due to line item restrictions, which were unknown to the publisher and aimed at "protecting" Google's serving stack.[854] It also admits that this line item restriction prevents Walmart from "operating its business."[855]

669. In 2017, Google also denied the Daily Mail a 2,000 line item increase.[856] Another email from 2017 further explains the Daily Mail's use case for additional line items, in particular, the need for MailOnline – the website of the Daily Mail – to have additional line items for their Header Bidding

---

[redacted]. ("[CBS requested Google to add line-items] to test multiple header bidding partners simultaneously, and then select one new partner to add.")

[850] GOOG-TEX-00209387 at -388. "Re: Ultra prio request for CBS - May 1st" (May 1, 2018). Internal Google email thread on line item limit exception for CBS with [redacted]. ("Without higher active line item limits, CBSi will not be able to test additional header bidders nor will they be able to onboard additional sites. As a result, CBSi's monetization goals will be hampered.").

[851] GOOG-TEX-00209387 at -389, -387. "Re: Ultra prio request for CBS - May 1st" (May 1, 2018). Internal Google email thread on line item limit exception for CBS with [redacted]. ("From an infrastructure perspective, we can accommodate this request. I think it is a business decision as to whether we want to give away ad serving resources to CBS to help them expand their header bidding usage"; "The decision has been not to provide with the exception request, but Eng will get involved with the CBS team to provide with other alternative solutions (potentially this week).")

[852] GOOG-AT-MDL-002625690 at -693. "Re: GAM Forecasting - Engineering Meeting Requested" (June 21, 2021). Internal email thread between Nathalie [redacted] ("Under pacing but forecast shows plenty of inventory.").

[853] GOOG-AT-MDL-002625690 at -692. "Re: GAM Forecasting - Engineering Meeting Requested" (June 21, 2021). Internal email thread between [redacted].("We are not getting a response from google [account] manager and this is a big deal we need their help with.").

[854] GOOG-AT-MDL-002625690 at -691. "Re: GAM Forecasting - Engineering Meeting Requested" (June 21, 2021). Internal email thread between [redacted]. ("The restriction is there to protect our serving stack and it is not easy/safe to lift it.").

[855] GOOG-AT-MDL-002625690 at -691, -690. "Re: GAM Forecasting - Engineering Meeting Requested" (June 21, 2021). Internal email thread between [redacted] ("Because of this, they frequently bump into issues related to limits (audience, forecasting, etc.) that prevent them from operating their business.").

[856] GOOG-TEX-00084843 at -844. "Re: Potentially raising LI limits for Daily Mail" (December 13, 2017). Internal email thread between [redacted]. ("Nope – definitely do not want to increase line item limits – not only does it put the FE at risk it perpetuates HB when in fact we have a viable alternative as a product.").

strategy.[857] This includes the need for additional Header Bidding partners and granularity. A 2021 internal email mentions another case of line item limit exception for three publishers.[858]

670. Despite the attempt to present this refusal as benefiting, or at least not harming, publisher revenue, Google's refusal to increase line item limits harms publishers' abilities to implement their Header Bidding strategies. Publishers' strategies around Header Bidding may go beyond revenue maximization and include considerations such as being less reliant on Google. In denying their requests for increased line items, Google is exercising its market power to restrict publisher's ability to diversify away from Google.

671. When Google did not deny publishers' line item requests, it often only granted a "modest increase." For instance, after the publisher Turner requested to double its active line item limit, Google only agreed to partially approve its request.[859] Google acknowledges that this only partial increase would harm Turner.[860]

672. Another example is The Washington Post requesting to increase its active line item limit from 61K to 100 K due to an increase in PG direct business.[861] However, internally, Google doubts that this increase in line items will result in more direct deals. It instead assumes that the limit increase will provide The Washington Post with more opportunities to do Header Bidding.

---

[857] GOOG-DOJ-15371945 at -947. "Re: Mail Online - DFP Line items limits" (October 31, 2017). Internal email thread between [redacted]. ("We had a call with the legal team from MailOnline today to discuss the final areas of the new DRX contract that are outstanding to get this over the line. This included the discussion around line item limits on their account again.").

[858] GOOG-AT-MDL-007290350 at -351. "Re: Active Line Items: Limits extension" (January 4, 2022). Internal email thread with [redacted] and others on publishers requesting more line items. ("We are asking this group to review the increasing Active line items (ALI) requests we have received from three different partners (Italiaonline, Cairo RCS, Frankly).").

[859] GOOG-TEX-00090969 at -969. "Re: Ultraprio - Increase the ALI for Turner" (September 26, 2018). Internal email thread with [redacted], and others. ("In the review we agreed to loan them a modest increase (61->75k) while we get our pricing strategy in place so we can charge for it and we get the move to 1p done which will make HB much less valuable. Doing it as a loan, so we can take it back and charge for it later.")

[860] GOOG-TEX-00090969 at -972. "Re: Ultraprio - Increase the ALI for Turner" (September 26, 2018). Internal email thread with [redacted], and others. ("The partner has reduced the pricing granularity of their Int header bidding line items to get back to being under the 61K limit but claim is having a revenue impact, and would like to move away from this ASAP.").

[861] GOOG-DOJ-32022633 at -641. "Re: FORK: ALI thread for Washington Post" (October 8, 2018). Internal Google email thread on an increase request for active line items for Washington Post with [redacted]. ("We have received an ultra-prio request to increase the ALI limit to 100K for The Washington post due to their PG growth […]").

673. Because of this, some Google employees suggest that The Washington Post should not be granted an increase.[862] These recommendations are made knowing that the refusal would harm The Washington Post, which had expressed that it "require[d] this strategy because [it] need the granular reporting it provides and it ensures a "smooth yield curve" which is important to their business."

674. However, a Google sales representative explains how The Washington Post would perceive this increased refusal. She suggests that because the actual reasoning behind the refusal is "unethical – because we are forcing out competition," to "kick out" Header Bidding, this will result in backlash.[863] Only after this explanation was, The Washington Post granted a partial 20K increase instead of the 40K requested.

675. Another employee argued that it is not unethical as the line item limit does "not make HB impossible," and insists that publishers are well aware of the line item limits.[864] This demonstrates that although Google did not proactively decrease line item limits, it strongly resisted attempts from publishers to increase their line item capacity to implement their Header Bidding strategy.[865] In October 2018, only 2 out of the 18 publishers over the limit were granted exceptions.[866]

676. Google imposed caps on line items for publishers which harmed their ability to access and monetize competing ad exchanges. When publishers requested exceptions, those were often denied

[862] GOOG-DOJ-32022633 at -637. "Re: FORK: ALI thread for Washington Post" (October 8, 2018). Internal Google email thread on an increase request for active line items for Washington Post with [redacted]. ("From what I collect, we don't feel comfortable with a 40k increase.").

[863] GOOG-DOJ-32022633 at -637. "Re: FORK: ALI thread for Washington Post" (October 8, 2018). Internal Google email thread on an increase request for active line items for Washington Post with [redacted]. ("It's unethical – because we are forcing out competition (no matter the good intentions and the reasonable impact on system stability) at the end of the day we are forcing them to change their business strategy kicking out HBs.").

[864] GOOG-DOJ-32022536 at -536. "Re: FORK: ALI thread for Washington post" (October 8, 2019). Internal email thread between [redacted], and others. ("The unethical point doesn't make sense to me. These are well-published limits of our system and we haven't changed them recently. In fact, the limit is sufficiently high precisely to not make HB impossible.").

[865] In his deposition, [redacted] claimed that, despite not remembering all the details, he remembered "mostly saying yes" to line item exception requests. However, [redacted] was involved in many of the examples I provided above showing Google's total or partial refusal to increase line items. He was included in the email threads discussing total or partial refusal to increase line items for publishers CBS, Italiaonline, Cairo RCS, Frankly, Turner. *See* Deposition of [redacted] Deposition (Managing Director, Global Commercialization for Publisher Advertising Products, Google), August 16, 2023.333:21-333:25. ("Q: Did Google ever deny a request to buy a publisher for additional line items so that they could use header bidding? A: I don't recall the details, but my -- I remember mostly saying yes.").

[866] GOOG-DOJ-15127000 at -003. "Re: ALI limits/ fee" (October 8, 2018). Internal Google email thread on the limit of active line items with [redacted] ("They are only 18 premium pubs over the current limit, only 2 of which actually have exceptions.").

outright for the largest publishers and sometimes only partially granted. These denials show a concerted effort by Google employees to prevent publishers from realizing the procompetitive benefits of Header Bidding and decreased publisher yield.

D. Google redacted key publisher data fields in order to suppress the adoption of Header Bidding

677. The fourth way in which Google restricted the operation of ad servers and ad server tools was in its choice to redact information. Google redacted valuable information that enabled publishers to evaluate and compare the performance of their inventory across different exchanges. Specifically, Google removed critical information from databases provided to publishers through DFP, rendering it impossible for publishers to know how much bidders on different exchanges were bidding for particular ad inventory, and impossible to evaluate the relative performance of exchanges more generally. Deleting this data for publishers, therefore, harmed competition amongst exchanges, as publishers simply could not evaluate their options of where to sell their inventory without this information. As with the other three anticompetitive conduct related to the operation of Google's product in the ad server market analyzed in this section, Google only made such redactions because Google had monopoly power in the ad server market and was vertically integrated into the exchange market. Google's monopoly power and vertical integration gave it both the ability and the incentive to redact valuable data that would otherwise be available to publishers and enable greater competition amongst exchanges. Thus, this conduct harmed competition, specifically the ability to compare prices across exchanges, and harmed publishers' operations.

678. I am unaware of how data redaction can be procompetitive. If Google suggests procompetitive benefits, I plan to evaluate such claims.

679. This section presents evidence documenting Google's conduct, intention, and impact on competition and publishers in the exchange market.

1) Google's data redactions

680. Publishers need detailed transaction data in order to understand the auction's operations, including bid amounts and how winning bids are determined, set reserve prices, and to monitor their financial performance across exchanges. Without this information, publishers have no ability to verify the

operations of an auction, compare performance across exchanges, or value their ad inventory.[867] In order to meet publisher needs, Google provides publishers with two types of data files: Data Transfer files and Bid Data Transfer files.[868]

681. Data Transfer files (or DT files) include nine different files related to requests, impressions, bids, clicks, etc.[869] These files present records of bids from both AdX and non-Google supply-side platforms that participate in Open Bidding, as well as bidding data for DSPs who bid through DFP and Open Bidding.[870] Those files, however, do not contain bids that come from Header Bidding auctions.

682. By contrast, the Bid Data Transfer files (or DBT files) include the bids of Header Bidders and the bid prices, including that of the winning bidder.[871] Both files included a "KeyPart" field[872] that publishers could use to link impressions across both files prior to 2019.[873] As explained below, this field was essential for publishers to be able to compare bids and outcomes of Header Bidding with outcomes other exchanges.

[redacted]

868 Google Ad Manager Help. "Ad Manager Data Transfer reports" (undated). Accessed on June 3, 2024. https://support.google.com/admanager/answer/1733124?hl=en#zippy=%25252Cabout-the-data-contained-in-data-transfer-files%25252Chow-files-are-delivered%25252Cfile-names%25252Cdata-transfer-files-in-the-ad-request-process%25252Cstore-files-locally%25252Clearn-about-the-bigquery-data-transfer-service%25252Cmake-large-data-transfer-files-easier-to-process%25252Cdownload-a-sample-file%2Cabout-the-data-contained-in-data-transfer-files%2Cdownload-a-sample-file%2Chow-files-are-delivered%2Cfile-names%2Cdata-transfer-files-in-the-ad-request-process%2Cstore-files-locally%2Clearn-about-the-bigquery-data-transfer-service%2Cmake-large-data-transfer-files-easier-to-process

869 [redacted]

870 Google Ad Manager Help. "Ad Manager Data Transfer reports" (undated). Accessed on June 3, 2024. https://support.google.com/admanager/answer/1733124 ("The NetworkBackfillBids file includes details about every Open Bidding and Authorized Buyers bid for your inventory, whether the bid won the auction or not.")

871 Google Ad Manager Help. "Ad Manager Data Transfer reports" (undated). Accessed on June 3, 2024. https://support.google.com/admanager/answer/1733124 ("NetworkCodeServes NetworkBackfillCodeServes | Records every response from Ad Manager, whether downloaded or not."); See also GOOG-AT-MDL-012840947 at -972. "'Trust me, I'm Fair": Analysing Google's Latest Practices in Ad Tech From the Perspective of EU Competition Law" (October 7, 2019). Discussion paper from Damien Geradin and Dimitrios Katsifis on Google's ad tech practices. ("… Data Transfer file includes information on an impression-by-impression basis, e.g. at which price an impression was sold, and to which buyer, as well as the bids of header bidding partners.")

872 Google Ad Manager Help. "Ad Manager Data Transfer reports" (undated). Accessed on June 3, 2024. https://support.google.com/admanager/answer/1733124?hl=en#zippy=%25252Cabout-the-data-contained-in-data-transfer-files%25252Chow-files-are-delivered%25252Cfile-names%25252Cdata-transfer-files-in-the-ad-request-process%25252Cstore-files-locally%25252Clearn-about-the-bigquery-data-transfer-service%25252Cmake-large-data-transfer-files-easier-to-process%25252Cdownload-a-sample-file%2Cabout-the-data-contained-in-data-transfer-files%2Cdownload-a-sample-file%2Chow-files-are-delivered%2Cfile-names%2Cdata-transfer-files-in-the-ad-request-process%2Cstore-files-locally%2Clearn-about-the-bigquery-data-transfer-service%2Cmake-large-data-transfer-files-easier-to-process

873 [redacted]

683. Prior to 2019, the "KeyPart" field uniquely identified an impression and, for the same impression, would take on the same values in the DT and BDT files such that publishers could match the activity and bids from Header Bidding process to the activity and bids for the same impression on the other exchanges.[874] In 2019, however, Google changed how the "KeyPart" field was generated across the two types of data files, such that an impression in the DT file now contained a different value of "KeyPart" for the same impression in the BDT file.[875] In short, by changing the way that KeyPart was generated (or "re-encoding" it), Google removed the ability for publishers to match DT files together.[876]

684. Before 2019, publishers could merge the two files using this "KeyPart" data field and learn, for a given advertiser, how much they paid for the publisher's inventory when bidding through a given exchange – for example, exchange "Zzz (EB)" versus through exchange "Vw".[877] Hence, publishers could compare yields for similar inventory across exchanges and channels, including Header Bidding.

685. In 2019, Google further truncated 20 data fields, seven of which are needed for yield comparison across channels.[878] These fields (BidAdvertisers, BidYieldGroupCompanyId, and BidYieldGroupNames) provide information about the classified advertiser of the ad that would show if the bid won, the ID of the yield partner that placed the bid, and the names of the yield groups that matched to allow this bid. By redacting these fields, Google prevented publishers from knowing relevant identifying information about auction winners.

---

[874] GOOG-AT-MDL-012840947 at -972. "Trust me, I'm Fair": Analysing Google's Latest Practices in Ad Tech From the Perspective of EU Competition Law" (October 7, 2019). Discussion paper from [redacted] and [redacted] on Google's ad tech practices. ("By linking the data included in the separate Data Transfer files publishers "tie" impression- level data - most importantly the price each ad slot is sold for - with (1) bids received from exchanges participating in header bidding, (2) bids received from Authorized Buyers, and (3) bids received from exchanges participating in Exchange Bidding.")
[875] Google Ad Manager Blog. "Rolling out first price auctions to Google Ad Manager partners" (September 5, 2019). Accessed on June 4, 2024. https://blog.google/products/admanager/rolling-out-first-price-auctions-google-ad-manager-partners/ ("In order to prevent bid data from being tied to individual users, you will not be able to join the Bid Data Transfer file with other Ad Manager Data Transfer files.")
[876] Google Ad Manager Blog. "Rolling out first price auctions to Google Ad Manager partners" (September 5, 2019). Accessed on June 4, 2024. https://blog.google/products/admanager/rolling-out-first-price-auctions-google-ad-manager-partners/ ("In order to prevent bid data from being tied to individual users, you will not be able to join the Bid Data Transfer file with other Ad Manager Data Transfer files.")
[877] Google Ad Manager Help. "Ad Manager Data Transfer reports" (undated). Accessed on June 3, 2024. https://support.google.com/admanager/answer/1733124?hl=en#zippy=%25252Cabout-the-data-contained-in-data-transfer-files%25252Chow-files-are-delivered%25252Cfile-names%25252Cdata-transfer-files-in-the-ad-request-process%25252Cstore-files-locally%25252Clearn-about-the-bigquery-data-transfer-service%25252Cmake-large-data-transfer-files-easier-to-process%25252Cdownload-a-sample-file%2Cabout-the-data-contained-in-data-transfer-files%2Cdownload-a-sample-file%2Chow-files-are-delivered%2Cfile-names%2Cdata-transfer-files-in-the-ad-request-process%2Cstore-files-locally%2Clearn-about-the-bigquery-data-transfer-service%2Cmake-large-data-transfer-files-easier-to-process; "NetworkRequests" (Top) "NetworkBackfillBids" (Bottom)
[878] GOOG-NE-04599495 at -496. "1P Bid Data Transfer Balancing transparency to publishers, with protecting buyer data and user privacy" (undated). Internal Google document. (The table summarizes field changes)

686. Furthermore, Google rounded some fields. Google rounded the BidPrice field to the nearest $0.10, which contained information about the bid price (net of the revenue share).[879] Google also truncated the Time and TimeUsec2 fields, which provide a formatted timestamp of the query and timestamp of the query relative to the Unit epoch.[880] Whereas before 2019 these timestamps recorded the second and microsecond (respectively) of the impression, these were changed in 2019 to record only the hour of the impression which is a significant loss of information to publishers. By rounding and truncating these fields, Google removed a significant amount of precision from the data available to publishers.

687. These redactions, rounding, and truncating of data represented a significant amount of lost information to publishers. The next sections explain how Google intended these changes to harm competition in the ad exchange market and was successful in doing so, and how these changes harmed publishers.

2) Google's claim that it redacted data based on privacy concerns is pretextual

688. This section explains that Google's true motivation in redacting data for publishers was to remove the ability of publishers to gain insights about their business on competing exchanges through joining the DT files, and ultimately to preference its ad exchange by removing publishers' abilities to compare their performance across competing exchanges and Header Bidding. Google concealed these motivations, however, by falsely claiming the changes were made in the interest of user privacy. It further obscured its motivations by also claiming that these were necessary in light of its move to a first-price auction format.

689. Google's sole intent in making the changes to the DT files was to remove the ability of publishers to join these files together and gain insights about their businesses and performance across various exchanges.

690. In a 2019 document, Google employees discuss the changes made to DT files. To the question, "Why do we redact and roun[d] data?" an employee explains, "We want to prevent a publis[her to be] able to determine "these advertisers were will[ing to pay] this much for that user's impression."[881] Google's intent is, hence, to limit the amount of information publishers receive to prevent them from

[879] GOOG-NE-04599495 at -496. "1P Bid Data Transfer Balancing transparency to publishers, with protecting buyer data and user privacy" (undated). Internal Google document. (The table summarizes field changes)
[880] GOOG-NE-04599495 at -496. "1P Bid Data Transfer Balancing transparency to publishers, with protecting buyer data and user privacy" (undated). Internal Google document. (The table summarizes field changes)
[881] GOOG-NE-04599495 at -495. "1P Bid Data Transfer Balancing transparency to publishers, with protecting buyer data and user privacy" (undated). Internal Google document.

establishing advertisers' willingness to pay across competing exchanges. To do so, Google first considered redacting and rounding the KeyPart and TimeUsec2 fields to prevent publishers from matching auctions and impressions information and ultimately identifying advertisers' willingness to pay. However, publishers were still able to join auctions and impressions information through other fields. Google also tested the ability to join DT and BDT files to ensure publishers could not link both files together.[882]

691. Google is aware that these changes harm publishers.[883] Google was also aware that data redaction would lead to complaints from publishers.[884] Finally, Google was aware, and indeed intended, that data redactions would harm competition in the exchange market.

692. Publicly, Google claimed that it redacted elements of Bid Data Transfer to protect user privacy. A 2019 document explaining the changes made to the DT files lays out Google's messaging strategy.[885]

693. Google also justified the redaction of data by introducing these changes at the same time as its first-price auction rollout. In a June 2019 strategy document, Google explains that transparency is an essential part of the rollout, enabling it to mitigate objections to some changes.[886]

---

[882] GOOG-DOJ-AT -01688915 at -915. "Re: Transparency Requests and Comms" (November 13, 2019). Internal Google email thread on transparency requests with [redacted].("I believe this exercise is to see if with both a DBM and AdX DT file, how closely can we match events, and their prices. This will then expose per impression price discrepancy (which will be stuff like fees taking effect) and aggregate loss of events."); Other internal documents show Google's reluctance to give publishers access to granular data. See for e.g. GOOG-AT-MDL-001414841 at -844. "Re: 1P reporting changes comms" (May 3, 2019). Internal Google email thread on reporting the change to 1P auctions with [redacted] ("Based on publisher's push back on lack of data during 1P experiment, would you be open to provide (aggregate) reporting to a limited set of publishers via e.g. internal dashboard"; " there is no need for publisher-facing reporting"; "okay with the aggregate insights, but want to avoid more granular insights on the 1P traffic at individual buyer/bid level […] to avoid pubs reading too much into temporary volatility in the 1P traffic, and ask questions that we may not be able to satisfactorily answer.")

[883] GOOG-DOJ-AT -01132404 at -404. "Re: Unified Pricing Rules/ 1P migration Sync" (June 26, 2019). Internal Google email thread on UPR and 1PA migration with [redacted]. ("Again, removing these fields will make the Bid file much less attractive to pubs."; "Removing BidAdvertiser, on the other hand, will significantly decrease the value of the file.")

[884] GOOG-DOJ-AT -01688915 at -915. "Re: Transparency Requests and Comms" (November 13, 2019). Internal Google email thread on transparency requests with [redacted]. ("We were hoping to have this information a while ago as we are increasingly getting pressure from clients to release the data.")

[885] GOOG-NE-04599495 at -495. "1P Bid Data Transfer Balancing transparency to publishers, with protecting buyer data and user privacy" (undated). Internal Google document. ("External Positioning […] Balancing transparency to publishers, with protecting buyer data and user privacy")

[886] [redacted])

694. However, Google also acknowledges that publishers will likely perceive the discrepancy between its transparency narrative and its changes to the DT and BDT files which prevented these from being joined.[887]

3) Data redactions harmed competition in the ad exchange market, and reduced publishers 'ability to effectively manage their inventory

695. This section explains how the redaction of data made it impossible for publishers to compare performance across exchanges and therefore harmed competition in the exchange market. Data redaction also significantly decreases the value of the ad server to publishers. Google documents analyzed in this section makes clear that Google recognized these effects, particularly given the concerns expressed by publishers to Google.

a) Publishers can no longer assess and compare performance across exchanges, which harms competition in the exchange market

696. By making these changes to DT files, Google limited the ability of publishers to run experiments.[888] This had the effect of preventing publishers from understanding bid performance, analyzing Google Ads bids, measuring the value of their first-party data and audience, and building value from their inventory. These changes also prevented publishers from using bidding data to detect if ad tech providers complied with their revenue share agreements.

697. Together, these changes meant that publishers lost the ability to compare relative performances of exchanges in Header Bidding and the ability to compare SSPs. This, in turn, limited the ability of rival SSPs to compete with Google by making it difficult for them to demonstrate value to publishers and simultaneously reducing publishers' incentives to consider rival SSP offerings. Overall, these changes made publishers more reliant on Google's ad server, enhancing Google's monopoly power in the ad server market and harming competition in the ad exchange market.

---

887 [redacted]

888 News UK. "ONLINE PLATFORMS AND DIGITAL ADVERTISING MARKET STUDY" (undated). Accessed on June 3, 2024. (See paragraph 3.8) https://assets.publishing.service.gov.uk/media/5e8c898d86650c18c6afeab4/News_UK_Response__1_.pdf

b) Data redactions harm publishers

698. Google internally acknowledges that breaking the joinability between the DT files "greatly diminishes the utility of data"[889] and removes the value of providing a bid landscape across all inventory.[890] Google has reduced the quality of ad serving via data redactions. Yet, publishers do not switch to other ad servers, for the reasons discussed in the report.

699. Google expected that disabling the ability to join DT and BDT files would lead to publishers' dissatisfaction, as is evident from Google's consideration of external communication.[891] As feared by Google, publishers escalated their frustration around Google's changes and the loss of value of Google's ad server products.[892] The notes further explain why the ability to join DT and BDT files is helpful for NewsCorp. This includes granularity of information, which negatively impacts yield.[893] NewsCorp complained: "You just made it worse. You are trying to kill HB!"[894]

700. Google suggested that it is "probably the unified auction and bid data transfer file changes that have reached him."[895] Another Google employee explained NewsCorp's discontent with the redaction of Bid Data Transfer files in more detail. In particular, it notes that "NewsCorp claims joining with this file is essential for evaluating the value of their inventory, set differential floor prices for subsets of users, and measure incrementality of revenue across different channels."[896]

701. Google intended for data redactions to severely restrict publishers' abilities to gain insights about their businesses across competing exchanges by making it impossible to join DT files, which contained

[889] [redacted].

[890] [redacted]

[891] GOOG-AT-MDL-001393488 at -489. "Re: Postponing the 100% launch of 1P auctions to Sep" (July 11, 2019). Internal Google email thread on postponing the launch of 1P auctions with [redacted] ("We'd like to be thoughtful in terms of how we roll-out the change [breaking bid DT joinability] to pubs that use the file currently (including NewsCorp), who would experience a disruption, by getting feedback from GTM, PR, and Sales to inform our approach.")

[892] GOOG-DOJ-15772422 at -424. Untitled. (September 10). Internal Google document with notes from internal meetings. (In particular, the publisher NewsCorp expressed its dissatisfaction. A Google employees note that NewsCorp was "mad" and that Google should use user privacy as a pretext.)

[893] GOOG-DOJ-15772422 at -425. Untitled. (September 10). Internal Google document with notes from internal meetings. ("The Bid DT changes are going to be disruptive to News Corp's yield management practices, and their measurement of success from their internal ad network, News")

[894] GOOG-DOJ-15772422 at -425. Untitled. (September 10). Internal Google document with notes from internal meetings.

[895] GOOG-DOJ-09715071 at -072. Untitled. (October 1, 2019). Internal Google email chain discussing the complaint of Newscorp with [redacted] and [redacted].

[896] GOOG-DOJ-09715071 at -071. Untitled. (October 1, 2019). Internal Google email chain discussing the complaint of Newscorp with [redacted] and [redacted].

valuable information that needed to be joined to be fully valuable. Indeed, Google's actions had the intended effect of preventing publishers from comparing relative performances between exchanges. Despite Google's attempts to tell a different narrative, publishers complained about the harm they suffered. Furthermore, competition in the exchange market was harmed because publishers' incentives to consider rival exchange offerings were reduced. Google successfully enhanced its market power in the ad server market by increasing the costs of switching away from DFP.

VIII. GOOGLE ENGAGED IN AUCTION MANIPULATION CONDUCT THAT HARMED COMPETITION IN THE AD EXCHANGE AND AD BUYING TOOLS MARKETS

702. While the previous two groups of conduct in this statement involve effective and explicit tying and changes to the operation of sell-side tools to steer transactions towards Google's advertising stack, throughout which Google was integrated, the final set of conduct are all properly characterized as auction manipulations, the purpose and effect of which was to make it harder for non-Google incumbents and new entrants to compete at various levels of the advertising stack including, most notably, the exchange market. I now turn to analyze these conduct.

703. Once again, these conduct tend to be technically complex rather than straightforward. They also involve an additional element of non-transparency to publishers and advertisers alike that created a complication to the competitive process; a complication that Google intended. From an economics perspective, however, when properly understood, these conduct all amount to a similar thing: to reduce the flow of transactions to Google's rivals, both actual and potential. The lack of transparency implied by Google's conduct made it difficult for Google's customers to know precisely what price they were paying for services. Those services could themselves encompass billions of separate auctions across the online display advertising industry.

704. One of Google's auction manipulation conduct, Bernanke, shifted transactions to Google's ad buying tool for small advertisers. Ad buying tools rely on transaction volume to inform bidding algorithms. Bernanke then made it difficult for ad buying tool rivals to accumulate the information they would need to provide services at an equivalent quality to Google's offerings, even though the data necessary was not the work product of Google but came from advertisers, publishers and consumers in the market. Google's auction In other words, Google had a choice as to whether to engage in these auction manipulations and, but for its monopoly power in particular markets and its vertically integrated structure, would not have had the ability nor the incentive to engage in those manipulations with the consequent impediments to the flow of information.

705. Another Google auction manipulation conduct, Dynamic Revenue Share, shifted transactions of high-value impressions to Google's ad exchange from rival competitors. Non-AdX exchanges face higher barriers to entry and expansion due to the need to attract both publisher and advertiser bids in order to provide a market with the thickness that characterizes AdX. Dynamic Revenue Share exacerbates that problem further raising artificial barriers to entry.

706. In what follows, I outline these auction manipulations and analyze evidence of Google's intent and the competitive outcomes. In each case, the particular conduct was implemented in one of Google's tools that bookend the advertising stack and involved manipulations to auction outcomes in ways that Google deliberately chose to make non-transparent to market participants. The conduct had the effect of steering more transactions to be completed within Google's own services on the ad tech stack but, critically, had the effect of restricting the flow of transactions to participants in ways that were likely to significantly harm the competitive process.

A. Overview of auction manipulation conduct

707. The hallmark of successful auction rules is a commitment to those rules.[897] This commitment requires a certain degree of trust in the auction designer. In many cases, contracts can be used to ensure that those rules are followed. In other cases, auctioneers have to choose designs that are credible in themselves.[898] Ultimately, market design will be efficient and more likely to be successful if those who participate in auctions feel safe and that the actions they undertake within the auction context will not be used against them.[899] This creates challenges because it is often the case that the auction designer might come to know more about auction participants than they need to know.[900]

708. In each of the auction manipulation conduct analyzed in this section, Google altered what participants believed they were doing in the auction and what participants believed Google was doing. The intent of these manipulations was to allow more transactions to be completed within Google's ad tech stack and, in the process, deny others the scale that would have allowed for a more efficient and competitive operation of the online display industry. In particular, it is well understood in economics that changes in auction rules can lead to changes in the composition of transactions that occur in markets.[901]

---

[897] Klemperer, Paul. "What really matters in auction design." Journal of Economic Perspectives. 16, no. 1. 2002. Pg. 169-189.
[898] Akbarpour, Mohammad, and Shengwu Li. "Credible auctions: A trilemma." *Econometrica.* 88, no. 2. 2002. Pg. 425-467.
[899] Roth, Alvin E. "What have we learned from market design?" *Economic Journal.* 118, no. 527. 2008. Pg. 285-310.
[900] Haupt, Andreas, and Zoë Hitzig. "Contextually Private Mechanisms." *Proceedings of the 23rd ACM Conference on Economics and Computation*. 2021.
[901] See, for example, Levin, Jonathan, and Paul Milgrom. "Online advertising: Heterogeneity and conflation in market design." *American Economic Review* 100, no. 2. 2010. Pg. 603-607; Arnosti, Nick, Marissa Beck, and Paul Milgrom. "Adverse selection and auction design for internet display advertising." *American Economic Review.* 106, no. 10. 2016. 2852-2866; and

Rather than the auction designer — Google — operating on one side of the auction, it had roles in multiple markets and on both sides of those markets. This created incentives to use monopoly power in any one market to manipulate auction outcomes in ways that benefited it multiple markets.

709. The first set of manipulations was a series of projects under the name of Bernanke. This involved manipulating the bids that GDN submitted to AdX on behalf of advertisers. GDN ran a second-price auction where it was often the case that the two highest bids were both submitted by GDN to the AdX auction. While this was the intention of the auction design, where bids reflected the willingness to pay of advertisers, there was also a sense in which GDN given this knowledge, was competing against itself. Under Bernanke, Google effectively stopped such self-competition and altered the two bids going into the auction. For advertisers, nothing would change. For publishers, if Google simply dropped the second-highest bid, their revenue would fall. In order to have their cake and eat it too, Google decided to make up the losses elsewhere by inflating the bids of higher value advertisers into the auction with a balancing act that was designed so that a publisher would not see a decline in average revenue.

710. However, as will be seen, Bernanke was kept secret and, moreover, was explicitly intended to overrule high publisher floors that caused AdX to miss out on transactions that were otherwise completed on other exchanges. As such, Bernanke distorted matches publishers' impressions and the ads delivered in GDN's favor, reducing the quality of matches.

711. At the same time, Bernanke impeded advertisers using rival ad buying tools from winning AdX auctions even when had the highest bid and the best ad for the impression (before the Bernanke adjustment). Bernanke then leveraged GDN's scale – reflected in how frequently GDN had the top two bids in the AdX auction – to deny rival ad buying tools transactions along with information about which bids result in wins to optimally set their bids. By altering the bids, publishers did not know what price they were paying Google (discounted from publishers' payout).

712. The second set of manipulations occurred under the banner of Dynamic Revenue Share. It was implemented on the sell-side of exchange markets. Rather than adjusting bids, Google would adjust the take rate that publishers paid for the completion of transactions on AdX. Initially, this involved lowering Google's take rate to allow impressions where the highest bid was just below the AdX floor to be drawn into the Google ad tech stack. However, Google then secretly altered Dynamic Revenue Share to increase the take rate on impressions that AdX could easily clear, so the average take rate of publishers was at its

---

Abraham, Ittai, Susan Athey, Moshe Babaioff, and Michael D. Grubb. "Peaches, lemons, and cookies: Designing auction markets with dispersed information." *Games and Economic Behavior*. 124. 2020. Pg. 454-477.

pre-Dynamic Revenue Share level. Like the Bernanke manipulations, this steered matches towards Google's ad tech stack and, in the process, obscured prices that would allow for the competitive process as well as restrict data that might otherwise have been gathered and employed to improve match quality on rival exchanges.

713. From Google's perspective, predation via Dynamic Revenue Share could effectively be algorithmically achieved without even short-run costs. Although I am not providing an opinion regarding the legal requirements for predatory pricing, Google's auction manipulation conduct does seem to share some characteristics with predatory pricing. The conventional conception of predatory pricing is where a firm that has a monopoly in a market drops its price below a price that would maximize short-run economic profits (and perhaps below short-run marginal cost) when faced with entry by a rival to ensure that rival faced subcompetitive profits or negative economic profits post-entry. These losses by the incumbent firm would be recouped should the entrant subsequently exit or perhaps further entry be deterred by the predatory actions.[902]

714. Normally, there are challenges in proving whether a lower price upon entry was predatory or just an expected competitive response. One challenge is whether the price is below equilibrium competitive prices and the incumbent firm deliberately sacrificed profits to undertake that pricing. Another is whether recoupment was expected or achieved.[903]

715. While the analysis below will demonstrate that Google understood that it was choosing to sacrifice profits as part of its auction manipulations — the part that lowered net bids via the take rate to appropriate more matches on its ad tech stack — recoupment of the lower take rate on high-demand impressions was baked into its algorithms. That is, while Google likely profited from its conduct's anticompetitive outcomes, recoupment was immediately possible in the form of higher prices imposed, unknowingly, on its own customers. Thus, from Google's perspective, predation could effectively be algorithmically achieved without even short-run costs. Therefore, even though Google acted to obscure its conduct to market participants, the economist's evidentiary threshold here is lightened for algorithmic predation relative to more conventional predatory conduct.

---

[902] Edlin, Aaron. "Predatory pricing." In In *Research Handbook on the Economics of Antitrust Law*. Edward Elgar Publishing, 2012.

[903] Kaplow, Louis. "Recoupment, Market Power, and Predatory Pricing." *Antitrust Law Journal.* 82, no. 1. (2018. Pg.): 167-220.

B. Bernanke

716. The first major project that Google employed to manipulate auction items in its own interests rather than the interests of its customers (in this case, publishers) occurred in Google's ad buying tools, affecting competition in the exchange market. Google's intention with this project was to adjust the bids from advertisers to ensure that rival ad-buying tools did not obtain information about the effectiveness of their bids for individual transactions that would allow rivals to engage in competitive selection of ad matches across stacks that Google did not own.

717. The higher GDN win rate from the Bernanke program allowed Google to maintain a critical informational advantage over other market participants and, with that advantage, subvert the process of competition. While Google implemented these manipulations in ways that would maintain its own take rate, on average, unchanged, this was only achieved on average and likely led to its customers unknowingly paying higher prices to Google that could be achieved both immediately and in equilibrium had the competitive process and these practices been transparent to them.

718. In this section, I present the evidence of this conduct, Google's intention and economic analyses of the likely harmful effects to competition that would allow Google to exploit and maintain its monopoly power on the ad buying tools markets and build monopoly power in the exchange market.

1) Timeline and functioning of Bernanke

719. In the AdX auction, buying tools, including GDN, submit bids to the auction to compete for a particular impression.[904] Prior to 2019, AdX ran a so-called dirty second price auction. Between 2013 and 2019, Google implemented various iterations of what was called "Bernanke" to manipulate the GDN bid submitted to AdX.

720. The conduct began in November 2013, when Google secretly launched Bernanke, a dynamic revenue-sharing program designed to manipulate bids placed on AdX by Google's ad-buying tool, GDN.[905] Described internally as a "quantitative easing" program, Bernanke took advantage of the fact that the AdX auction allowed participants to submit two bids and GDN's scale reflected in the fact that GDN had the two highest bids in the auction [redacted] of the times it won.[906,907,908]

---

[904] GOOG-NE-13468541 at -541. "Bernanke experiment analysis (THIS IS THE INTERNAL TO GTRADE DOC NOT TO BE SHARED!)." (February 12, 2018). Internal Google document by [redacted].

[905] Google's First Am. Resps. and Objs. to Plaintiff's Third Set of Interrogs. (May 24, 2024) at 12.

[906] GOOG-AT-MDL-001283154 at -154. "Bernanke for GDN Newsletter" (November 27, 2013). Internal Google document on the Bernanke program. ("The second bid that GDN submits to AdX can be a huge subsidy to the publisher. [redacted]").

721. At a high level, Bernanke did the following: When GDN submitted the top 2 bids on AdX, effectively second-pricing itself, Bernanke raised the [redacted] GDN revenue share . Google created a "pool" (akin to a bank account, albeit one that publishers did not know about or control) for each publisher with the excess funds from Bernanke to inflate bids from GDN in future auctions where GDN did not submit the winning bid by taking a lower buyside revenue share.[909]

722. Rather than collecting a [redacted] revenue share,[910,911] on high demand impressions Bernanke lowered the revenue share and enabled GDN to use the pool of excess funds to inflate the GDN bid "to allow advertisers to win even more AdX auctions."[912] As Google explained, when Bernanke was launched, the cost from draining the pool of excess funds would be balanced "by increasing the revshare on other auctions by lowering GDN's second bid (which is used to second-price GDN sometimes)."[913]

[907] GOOG-AT-MDL-004248075 at -079. "AdX Auction Logic" (October 20, 2014). Internal Google presentation stating that only AdWords may submit two bids to the AdX auction. ("Only AdWords may submit two bids. All other buyers may only submit one bid per ad request.").

[908] GOOG-NE-13468541 at -541. "Bernanke experiment analysis (THIS IS THE INTERNAL TO GTRADE DOC NOT TO BE SHARED!)" (February 12, 2018). Internal Google document by [redacted] ("Analysis shows that on queries won by GDN, GDN second prices itself over [redacted] of the time. If GDN were to only submit one bid, the publishers will only receive [redacted] of their current payout.")

[909] GOOG-DOJ-14952731 at -731. "[Launch 106307] gTrade: Project Bernanke" (September 24, 2013). Internal Google gTrade team launch document of Bernanke. ("With this project, we are doing a little quantitative easing on the AdX, a la Bernanke: GDN will take a *negative* revshare to allow advertisers to win even more AdX auctions. The cost from this negative revshare will be balanced by increasing the revshare on other auctions by lowering GDN's second bid (which is used to second-price GDN sometimes"); See also GOOG-TEX-01266874 at -874. "Bernanke experiment analysis (THIS IS THE INTERNAL TO GTRADE DOC NOT TO BE SHARED!)" (February 12, 2018). Internal gTrade team document on the results of a Bernanke experiment. ("As part of project Bernanke, we reduce the second bid (and in some cases drop the second bid completely) and create a pool of money, which we then reinvest by increasing the first bid on queries in order to win potentially unmatched queries.")

[910] Google's percent revenue is listed as [redacted] on some documents and [redacted] on others. See GOOG-NE-13624783 at -786. "gTrade Team Background" (April 21, 2020). Internal gTrade PowerPoint on Bernanke. ("[redacted]"); GOOG-DOJ-28385887 at -889. "Beyond Bernanke" (August 17, 2015). Internal gTrade PowerPoint on Bernanke. ("Submit top two CAT2 bids to the AdX auction after deducting GDN buy-side margin of [redacted].");

[911] [redacted]

[912] GOOG-DOJ-14952731 at -731. "[Launch 106307] gTrade: Project Bernanke" (September 24, 2013). Internal Google gTrade team launch document of Bernanke. ("With this project, we are doing a little quantitative easing on the AdX, a la Bernanke: GDN will take a *negative* revshare to allow advertisers to win even more AdX auctions.")

[913] GOOG-DOJ-14952731 at -731. "[Launch 106307] gTrade: Project Bernanke" (September 24, 2013). Internal Google gTrade team launch document of Bernanke. ("The cost from this negative revshare will be balanced by increasing the revshare on other auctions by lowering GDN's second bid (which is used to second-price GDN sometimes").

Figure 27

[redacted]

723. It is important to note that Google expected to achieve its own [redacted] revenue share "in expectation." That means that over some period of time, Google would collect [redacted], on average, of advertiser payments. However, since Google was operating this as a statistical procedure, this was not guaranteed, and publishers could end up paying more to Google but without knowledge of that to allow them to consider alternative selling options.

724. In 2015, Google launched Global Bernanke.[915] Global Bernanke operated similarly to the previous iteration of Bernanke, with the added nuance that allowed GDN to charge [redacted] on average across *all* publishers rather than per publisher.[916]

725. Global Bernanke only increased the risk to publishers as Google averaged its take rate across all publishers and not a given publisher. This meant that some publishers may end up paying more to Google but without knowledge of that. When a company's customer is charged a higher price for a service, the customer must know what is happening for competitive processes to operate. However, Google operated this entire algorithm statistically, which meant that publishers could not transparently identify whether a decline in revenues it received after Google took its payment was due to Google's actions or some other

---

914 [redacted]
915 Google's First Am. Resps. and Objs. to Plaintiff's Third Set of Interrogs. (May 24, 2024) at 12.
916 GOOG-DOJ-AT -02471194 at -194. "Global Bernanke" (July 26, 2015). Internal gTrade document on Global Bernanke. [redacted]

change in market conditions. Publishers need that knowledge to decide whether alternative options involve a low price to be paid. However, by design and by choice, Google did not make that information available to publishers. Thus, the first step in enabling competitive forces to work was subverted.

726. In the following section, I will provide more details about the evolution and nuances of Bernanke. In so doing, my focus is on the economic consequences of Bernanke, and I do not offer any opinion on whether such conduct was deceptive and may have violated laws other than antitrust laws. The sike focus of my report is on the economic analysis to support consideration of anticompetitive consequences.

727. [redacted]

[917] GOOG-AT-MDL-001412616 at -618. "Project Bernanke and margins story" (Q1 2019). Internal Google PowerPoint on Bernanke. The slide shows "Adwords bid b_1" and "Adwords bid b_2" both being submitted to the CAT2 auction.

[918] GOOG-AT-MDL-001412616 at -621. "Project Bernanke and margins story" (Q1 2019). Internal Google PowerPoint on Bernanke. ("Alpha and beta as two knobs: we win some queries that we wouldn't have won otherwise. Lowering beta: lower pub payout.").

Figure 28

[redacted]

728. [redacted][921]

729. Through Bernanke, Google could overcharge advertisers the GDN take rate for low-demand impressions and subsidize the GDN take rate on high-demand impressions that GDN was likely to lose. According to the gTrade team, the subsidization was balanced by the overcharge.[922]

730. For a given publisher, Bernanke could lower bids enough times that there remains a pool of excess funds that are not fully applied to high-demand impressions for that publisher. In this situation, even if Bernanke ensures the [redacted] take rate is achieved overall, the publisher would not earn their full

[919] [redacted]

[920] GOOG-NE-13468541 at -542. "Bernanke experiment analysis (THIS IS THE INTERNAL TO GTRADE DOC NOT TO BE SHARED!)" (February 12, 2018). Internal Google document by [redacted]. ("It is important to note that in this entire process, we only use information about the GDN bid and the GDN price paid on queries won by GDN. In other words, we do not use any AdX buyer information.").

[921] [redacted]

[922] GOOG-NE-06839089 at -098, -099. "Project Bernanke: Quantitative Easing on the AdExchange." (October 2013). Internal gTrade PowerPoint on Bernanke.

expected payout. Because of this, the Bernanke model incorporated a safety mechanism to prevent significant loss of yield. However, Bernanke still allows some publishers to receive only [redacted] of their expected payout.[923]

731. Until 2015, Google maintained a pool to achieve an average take rate by publisher. For every impression where Bernanke reduced a publisher's revenue, Google would overpay for another impression.[924] In 2015, Google launched "Global Bernanke," which turned the pool from a per-publisher average take rate to a pool across publishers.[925] The model used publisher-specific factors such as expected conversion rate and potential to win incremental queries in deciding publisher margin and balancing the pool.[926]

732. By 2019, AdX began operating a first price (1P) auction. The move to the 1P auction required a change to Bernanke.[927] The new 1P Bernanke project was called Alchemist.[928] Google's stated goal with the Alchemist project was to keep bidding truthful on the buy-side, where advertisers have no incentive to misreport their value and still bid in the first-price auction.[929] Google described that the Alchemist, or 1P Bernanke optimized for "publisher welfare" despite being a buy-side tool.[930]

733. Google secretly launched Bernanke and all subsequent iterations of the program. Internally, when discussing the development of various GDN communications, Google explicitly made clear that "the first

---

923 GOOG-DOJ-AT -02471194 at -194. "Global Bernanke" (July 26, 2015). Internal gTrade document on Global Bernanke. [redacted]

924 GOOG-NE-13468541 at -541. "Bernanke experiment analysis (THIS IS THE INTERNAL TO GTRADE DOC NOT TO BE SHARED!)" (February 12, 2018). Internal Google document by [redacted]. ("As part of project Project Bernanke, we reduce the second bid (and in some cases drop the second bid completely) and create a pool of money, which we then reinvest by increasing the first bid on queries in order to win potentially unmatched queries.")

925 GOOG-DOJ-15637938 at -938. [redacted]).

926 GOOG-DOJ-15637938 at -938. [redacted] ("This deviation is algorithmic, and is based on both the conversion rate on each publisher and the potential to win incremental queries and revenue on each publisher. Competitive publishers where we have opportunities to win new queries over reserves or competition and publishers where incremental conversions come at a high conversion rate (conversion / queries) both are likely to see lower margins.").

927 Google's First Am. Resps. and Objs. to Plaintiff's Third Set of Interrogs. (May 24, 2024) at 12.

928 GOOG-DOJ-AT -02224828 at -828. "The Alchemist" (March 2019). Internal Google document on the Alchemist's mechanism. ("The Alchemist (AKA First Price Bernanke)").

929 GOOG-DOJ-AT -02224828 at -828. "The Alchemist" (March 2019). Internal Google document on the Alchemist's mechanism. ("Alchemist is a mechanism that: is truthful: no advertiser has an incentive to misreport her value; is individually rational: no advertiser pays more than its declared value; submits first price bids to publishers (while being truthful from buyer's perspective).").

930 GOOG-DOJ-AT -02224828 at -828. "The Alchemist" (March 2019). Internal Google document on the Alchemist's mechanism. ("Alchemist is a mechanism that: […] maximizes welfare for its spending: no mechanism can pay the same/lower amount of money to publishers and achieve a higher welfare.").

rule about Bernanke is we don't talk about Bernanke."[931] The intent of this secretive rollout was to ensure that publishers could not detect Bernanke's effects.

734. To do so, Google used small holdback group experiments to assess the impact of Bernanke. For example, as stated by [redacted], Research Scientist at Google, "we have a 1% experiment running, which is enough to assess impact sans GDN reaction. The question is whether we can ramp up low enough so that pubs don't notice but high enough so that GDN reaction can be assessed." In response to this comment, Nitish Korula, stated hopes that a proposed 20% experiment "falls in the sweet spot of low enough to not be noticed by pubs, while high enough that we get some estimate of the reaction."[932]

735. Google also did not want advertisers to realize the effect of Bernanke because it was "borderline fraudulent."[933]

736. Beyond concealing the launch of all iterations of Bernanke, Google's intent for Bernanke was to ensure GDN won more AdX auctions over rival buying tools. I explain this in more detail in the following sections.

2) Bernanke harmed competition in the market for ad buying tools for small advertisers

737. Google designed Bernanke to help its ad buying tool for small advertisers win more transactions at the expense of rivals on AdX. The conduct relied on anticompetitive means to achieve Google's goal to "win more."[934] Bernanke and its variants relied on Google's monopoly power in the market for ad buying tools for small advertisers.

---

931 GOOG-DOJ-15445619 at -620. June 2017. "Re: GDN Mediation Detection AM Email Followup" – Internal Google email between [redacted]. ("We can't talk about this at all. I recognize this is frustrating and lacks an escalation path so I'll push this one more time, however I keep hitting a "the first rule about Bernanke is we don't talk about Bernanke" situation.").

932 GOOG-DOJ-14157039 at -039. "Re: Drop AdWords from open auction: let's actually do it" (October 10, 2016). Internal email thread between [redacted].

933 GOOG-DOJ-15435620 at -621. "Re: Would FB prefer bidding into a second-price auction?" (March 27, 2017). Internal email thread between [redacted]. ("From an intelligent bidder's POV most auctions aren't run honestly, with the level of dishonesty ranging from mild (e.g. RPO) to moderate (e.g. soft floors) to borderline fraudulent (e.g. bidder and seller see different clearing prices w/SSP pocketing the difference).")

934 GOOG-DOJ-28494174 at -181. "Display Strategy Working Document" (August 2013). Internal document on Google's strategy for display. ("With Bernanke, we seek to win even more AdX auctions by taking negative buyside margin on competitive AdX auctions – effectively increasing GDN's top bid into AdX beyond the advertiser's willingness to pay.").

a) Google implemented Bernanke to override publishers' high floors on AdX

738. As Google described in its Bernanke experiment analysis, "the current match rate on AdX (i.e., queries where there is a winning ad) is about [redacted]. The primary reason for the low match rate is the reserve prices set by the publisher, which need to be beat for an ad to win the auction."[935] Google developed Bernanke so that GDN could clear more impressions on AdX; impressions that GDN would otherwise have lost due to high publisher floor prices. Based on a Google email from [redacted], Vice President of Engineering for Display and Video Ads at Google, Bernanke was designed to allow GDN to "bid higher in order to clear a floor."[936]

739. Additionally, Google discussion on Bernanke state that applying the alpha multiplier to raise the first GDN bid into AdX "helps GDN overcome floors and reserve prices."[937] However, if clearing previously high floors was the only impact of Bernanke, I would expect to see increased transactions in AdX for GDN and little change for other AdX buyers. However, the main impact of the program is that GDN transactions increase while other AdX buyer matches decrease after launch.

740. Bernanke creates three possible auction scenarios that have varying impacts on rival ad-buying tools.

741. In the first possible scenario, when GDN second bids itself, Bernanke kicks in to deflate or drop the second bid, and the GDN advertiser pays the original second price. In this scenario, Bernanke does not affect the non-Google advertiser in this auction. The impression would be won and paid by the Google advertisers with or without Bernanke.

742. Similarly, in the second possible scenario, Bernanke does not impact non-Google advertisers. In this auction scenario, when the publisher's floor price is higher than all submitted bids, Bernanke inflates the GDN bid to be higher than the floor price. Without Bernanke, the non-Google advertiser would not have won the transaction since its bid was lower than the floor. Although Bernanke allows a GDN

[935] GOOG-NE-13468541 at -541. "Bernanke experiment analysis (THIS IS THE INTERNAL TO GTRADE DOC NOT TO BE SHARED!)" (February 12, 2018). Internal Google document by [redacted].
[936] GOOG-NE-13549438 at -438. "Re: Bid transparency" (February 17, 2017). Internal email thread between [redacted]. ("It sounds like I don't understand how Bernanke works, I was under the impression we bid higher in order to clear a floor, not go crazy over.").
[937] GOOG-NE-11902954 at -966. "Aligning for a programmatic future" (undated). Internal Google document on programmatic future regrouping product and sales meeting notes. ("First AdX bid is between 1-4x GDN first bid = helps GDN overcome floors and reserve prices, and beat out AdX Buyers.").

advertiser to win the impression on a per-transaction basis, this does not impact non-Google advertisers but it increases GDN wins on AdX.

743. However, in the third possible scenario, Bernanke appropriates the impression away from the non-Google advertiser. When a non-GDN buying tool offers the highest bid, Bernanke kicks in to inflate the Google bid. With Bernanke, the inflated GDN bid becomes the highest bid, and GDN wins the auction. Google subsidizes transactions with the Bernanke pool. The non-GDN advertiser is worse off because it no longer wins the impression it would have won without Bernanke.

744. The harm to non-Google advertisers is confirmed by Google's internal documentation, which is presented in the following sections.

b) Google designed Bernanke to enable GDN to win more auctions

745. Google used Bernanke to win more queries over rival ad-buying tools. According to Google, similar to how buy-side Dynamic Revshare allowed GDN to "win more auctions against AdX buyers and clear publishers' Min CPM reserves more often,"[938] Bernanke would take "the concept of Dynamic Revshare further" by seeking "to win even more AdX auctions."[939] Google also recognized that Bernanke could "increase GDN's win rate, partially at the expense of other AdX buyers' success on AdX."[940]

746. Google discussion of Bernanke states that applying the alpha multiplier to raise the first GDN bid into AdX, "helps GDN […] beat out AdX Buyers."[941] Google predicted that Bernanke would lead to an [redacted] in revenue for rival buying tools, equivalent to a [redacted] per year.[942]

---

938 GOOG-DOJ-28494174 at -181. "Display Strategy Working Document" (August 2013). Internal document on Google's strategy for display. ("Because the variable buyside margin increased GDN's post-buyside-margin bids into the AdX auction, Dynamic Revshare allowed GDN to win more auctions against AdX buyers and clear publishers' Min CPM reserves more often.").
939 GOOG-DOJ-28494174 at -181. "Display Strategy Working Document" (August 2013). Internal document on Google's strategy for display. ("Project Bernanke (Q3 2013), gTrade's next big thing, takes the concept of Dynamic Revshare further. With Bernanke, we seek to win even more AdX auctions by taking negative buyside margin on competitive AdX auctions -- effectively increasing GDN's top bid into AdX beyond the advertiser's willingness to pay.").
940 GOOG-DOJ-28494174 at -182. "Display Strategy Working Document" (August 2013). Internal document on Google's strategy for display. ("All of these GDN bid strategies could increase GDN's win rate, partially at the expense of other AdX buyers' success on AdX.").

941 GOOG-NE-11902954 at -966. "Aligning for a Programmatic Future" (undated). Internal Google document for building out alignment on plan for programmatic across Product and Sales teams. ("First AdX bid is between 1-4x GDN first bid = helps GDN overcome floors and reserve prices, and beat out AdX Buyers.").
942 GOOG-DOJ-AT -02513569 at -573. "gTrade Team Background" (undated). Internal gTrade document on GDN bidding optimization. The Log Simulation slide shows that spend for AdX buyers was ("-18%(-$75M/year)."

747. In a 2013 presentation, Google also stated that Bernanke's goal is to maximize GDN profit.[943] The gTrade simulation details an expected [redacted] in profit for GDN, equivalent to [redacted] per year.[944]

748. By 2014, Google began testing the impact of the proposed Global Bernanke program. A September 2014 internal document presents findings from a simulation of how Global Bernanke would operate and differ from Bernanke.[945] The simulated results show that Global Bernanke would increase daily GDN-matched queries anywhere from [redacted] and potentially increase annual GDN revenues by approximately [redacted] depending on the allowed maximum margin per publisher.

749. Another experiment describing the effect of Global Bernanke prior to its launch indicated that the program would lead to an uplift in various metrics. For example, GDN revenue was projected to increase by [redacted], equivalent to approximately [redacted] annually.[946]

c) GDN won more auctions without improving price or quality as a result of Bernanke

750. Experiments launched after the implementation of Bernanke confirm that GDN won more AdX transactions and earned more revenue, all at the detriment of rival buying tools. A 2013 experiment on 5% of the traffic shows that the "current impact" of Bernanke was a [redacted] in the GDN win rate, corresponding to nearly [redacted] more matched queries per day, while at the same time, rival buying tools experienced a [redacted] in matched queries.[947] As a result, GDN profits rose by [redacted], or nominally, [redacted] per year. Rival buying tools realized an [redacted] in spending, equivalent to a [redacted] decrease per year. The combined increase in profit to GDN and AdX due to Bernanke resulted in a [redacted] per year increase in profit to Google. Hence, Bernanke improved Google's bottom line at the expense of rival buying tools.

---

943 GOOG-DOJ-28386151 at -158. "Project Bernanke: Quantitative Easing on the AdExchange" (December 10, 2013). Internal gTrade PowerPoint on Bernanke. ("[redacted]). GOOG-NE-09173599 at -600. "How do we make Ad Manager publishers' primary monetization platform?" (August, 2019). Google internal document on programmatic video strategy. The document mentions that Google Ads represents [redacted] of total AdX revenue. ("Additionally, our exclusive pool of Google Ads demand [redacted]) is not eligible to serve to any publisher not leveraging the full-stack Google solution (i.e. Spotify, Disney, etc.).")

944 GOOG-DOJ-AT -02513569 at -573. "gTrade Team Background" (undated). Internal gTrade document on GDN bidding optimization. The Log Simulation slide shows that GDN profit was [redacted]."

945 GOOG-DOJ-27804205 at -209. "Global Bernanke" (September 30, 2014). Internal Google PowerPoint on Global Bernanke. The slide shows "Offline Simulation Results" for "Regular Bernanke" and when there is "no pub margin constraint."

946 GOOG-DOJ-AT -02471194 at -195. "Global Bernanke" (July 26, 2015). Internal gTrade team document on Global Bernanke. [redacted]).

947 GOOG-DOJ-28386151 at -167. "Project Bernanke: Quantitative Easing on the AdExchange" (December 10, 2013). Internal gTrade PowerPoint on Bernanke.

751. Google had the ability to implement Bernanke and recoup losses from subsidized impressions because GDN often wins in less competitive auctions. A Google presentation from 2013 shows that Google Display Network 'second-bid' itself [redacted] of the time among the auctions it won.[948] Another internal presentation in 2013, shows that [redacted] of the AdX revenue of a major ecommerce publisher comes from Google Ads being the only bidder.[949]

752. By April 2014, Google presented an update on Bernanke, noting that since its launch in November 2013, the program added [redacted] and increased GDN revenue by [redacted].[950] By 2015, Google reported that Bernanke had increased matched queries for GDN by [redacted] and increased GDN revenue by approximately [redacted], approximately [redacted].[951] As intended, the number of matched queries for third-party buyers dropped by more than [redacted], demonstrating the magnitude of harm Bernanke had on non-Google ad-buying tools.[952]

d) GDN won more auctions without improving price or quality as a result of Global Bernanke

753. After its implementation in May 2015, Global Bernanke had an impact comparable to its predecessor. A May 2015 internal email confirmed that Global Bernanke increased GDN revenue by [redacted], equivalent to [redacted] annually.[953] Global Bernanke also increased the GDN win rate by [redacted].[954]

754. Additionally, Google recognized that, in some situations, Global Bernanke harms a publisher's total yield management ("TYM"). This occurs when Bernanke allows GDN to win against rival ad-buying tools.[955]

---

[948] GOOG-NE-13624783 at -785. "gTrade Team Background" (April 21, 2020). Internal gTrade presentation on Bernanke. [redacted]

[949] GOOG-AT-MDL-014178492 at -495. "Detailed calculation of AdWords value in AdX monetization" (June 2013). Internal Google presentation analyzing the value of AdWords in AdX. [redacted]

[950] GOOG-NE-03872763 at -781. "Discussion on improving AdX & AdSense backfill" (undated). Internal Google presentation on AdX and AdSense mediation. ("GDN Bernanke: Launched on November 2013; Added another 1.1bn queries; Increased revenue by [redacted].").

[951] GOOG-DOJ-28385887 at -895. "Beyond Bernanke" (August 17, 2015). Internal gTrade PowerPoint on Bernanke.

[952] GOOG-DOJ-28385887 at -895. "Beyond Bernanke" (August 17, 2015). Internal gTrade PowerPoint on Bernanke.

[953] GOOG-NE-06592460 at -460. "[Launch 133445] Global Bernanke [redacted]" (May 21, 2015). Internal email thread on the launch of Global Bernanke. [redacted]

[954] GOOG-NE-06592460 at -460. "[Launch 133445] Global Bernanke [redacted])" (May 21, 2015). Internal email thread on the launch of Global Bernanke. [redacted]

[955] GOOG-NE-07249237 at -237. "Re: Bernanke on Admob" (April 26, 2016). Internal email thread with Nirmal Jayaram, Duke Dukellis, Martin Pál, and others. ("the increase in AdX revenue is less than the corresponding drop in 3p network revenue, […] the pub earns a little bit less overall when Bernanke is on.")

3) Projects Bernanke and Global Bernanke harmed publishers by reducing the effectiveness of monetization of their inventory

755. The effects of Bernanke on publishers vary between auction scenarios and amongst publishers. At times, some publishers can benefit from Bernanke by increasing their payout. However, the increase in publisher payout due to Bernanke is not truly beneficial to publishers. By raising bid prices from GDN, Bernanke harms publishers by inflating bids of low-quality ads that would not clear the publisher-set price floor. This harms publishers' reputations, which in turn can have a significant impact on their revenue stream. The New York Times escalation issue described below is a notable example of this situation. Thus, any increase in publisher payout due to Bernanke distorts the negative impact of a lower-quality ad appearing on a publisher's website.

756. Finally, by switching to Global Bernanke and managing the [redacted] take rate across publishers, Google harmed some publishers that were charged more than [redacted]. Despite some safety mechanisms, a segment of publishers received an overall lower payout than they would have received absent Bernanke.

757. It is critical for publishers to be able to control the ad quality displayed on their websites.[956] Google acknowledged that "many AdX publishers are very sensitive to ads that they feel reflect badly on their brand and unwilling to risk any exposure at all; when such ads […] appear on their pages, they may react by pulling their inventory from AdX altogether."[957]

758. Publishers set price floors to control the quality of ads that appear on their website, as low-price bidders tend to serve low-quality ads. The internal Google document titled "Protecting Publishers from Objectionable Ads" explains that "a lot of pubs set a [price] floor specifically to keep out low quality ads."[958] Similarly, an industry article explaining what publishers should consider when setting floor prices explains that "by implementing a price floor, publishers can […] prevent low-quality ads from being delivered and served on their websites. This is incredibly important as we're constantly beaten over the head with the gravity of the user experience and how bad ads and poor delivery can severely affect it which ultimately affects your bottom line."[959]

[956] A Kantar Publisher Impact study proved a direct correlation between a publisher's brand perception and the effectiveness of the ads it displays on its properties. High-quality ads lead to better user experience, higher engagement, and thus higher revenue for publishers.
[957] GOOG-DOJ-15769995 at -995. "Protecting Publishers form Objectionable Ads" (May 2017). Internal Google document on potential harmful ads for publishers.
[958] GOOG-DOJ-15769995 at -995. "Protecting Publishers form Objectionable Ads" (May 2017). Internal Google document on potential harmful ads for publishers.
[959] Headerbidding.com. "What Should I Consider While Setting Floor Prices?" (May 31, 2022). Accessed on June 4, 2024. https://headerbidding.com/optimizations/what -should-i-consider-while-setting-floor-prices/

759. Bernanke overrides the purpose of publisher-set price floors by inflating bids that would otherwise not clear the floor. By doing so, Bernanke enables lower-quality ads to be transacted and displayed on publishers' properties. This harms publishers' reputations, which in turn can significantly impact their revenue stream.

760. Google internally acknowledged the quality issues that Bernanke generated. A notable escalation of this issue concerns The New York Times. A 2016 email explains that The New York Times was experiencing clickbait ads promoting fake news.[960] In response, Google employees stated that Bernanke was responsible for this escalation.[961] Specifically, they note that Bernanke overrode The New York Times' floor prices for 68% of the problematic impressions that led to this issue. Without Bernanke, two-thirds of the problematic ads would not have cleared The New York Times's high floor price and would not have been transacted. Google describes the mechanism of Bernanke as a way to "jump the floors reducing their effectiveness." The effect of Bernanke in this situation left one Google employee to reflect that "we should just shut off Bernanke."[962]

761. The New York Times' escalation illustrates the lack of control that one of the largest publishers faces due to Google's secretive and misleading auction manipulation. Bernanke blurs Google's auction logic for publishers, limiting publisher decision-making power and diminishing their control of ad quality on their websites. As a result of Bernanke, The New York Times had to find a solution to block low-quality ads. The email mentions that the "only solution so far has been to jack the floor."[963] However, even if The New York Times raised floor prices, the solution could also prove useless if Bernanke uses an alpha multiplier to raise bid prices of low-quality ads from GDN in the future.[964] Bernanke overrides the purpose of publisher-set price floors by inflating bids that would otherwise not clear the floor. By doing

[960] GOOG-DOJ-15084405 at -409. "Fwd: NYTimes Escalation/ Next Steps" (December 14, 2016). Internal email thread between [redacted].

[961] GOOG-DOJ-15769995 at -998. "Protecting Publishers form Objectionable Ads" (May 2017). Internal Google document on potential harmful ads for publishers. There is a high likelihood that both documents reference the same New York Times' escalation. The email thread is dated from December 2016 and the strategy document is from May 2017. Both documents refer to problematic ads as the reason for the escalation. ("From what I could tell, our auction optimizations (Bernanke) were responsible for 68% of impressions in the NY Times escalation.")

[962] GOOG-DOJ-15769995 at -998. "Protecting Publishers form Objectionable Ads" (May 2017). Internal Google document on potential harmful ads for publishers. ("wow, makes me think we should just shut off bernanke for these pubs.").

[963] GOOG-DOJ-15084405 at -407. "Fwd: NYTimes Escalation/ Next Steps" (December 14, 2016). Internal email thread between [redacted]. ("NYT pinged me today and is trying to figure out how to block this stuff technically on their end from showing up from AdWords. Their only solution so far has been to jack the floor on AdWords demand.").

[964] As mentioned above, Google could inflate the highest bid by up to 4 times. *See* GOOG-NE-13468541 at -542. "Bernanke experiment analysis (THIS IS THE INTERNAL TO GTRADE DOC NOT TO BE SHARED!)" (February 12, 2018). Internal Google document by [redacted]. ("We pick various bid multipliers between 1 and 4 and evaluate whether GDN will win that query at each of these bid multipliers.").

so, Bernanke enables lower-quality ads to be transacted and displayed on publishers' properties. This harms publishers' reputations, which in turn can significantly impact their revenue stream.

762. Another Google email thread shows that Bernanke leads publishers to raise their floor prices to counteract the negative effect on ad quality imposed by the overriding of floors.[965]

763. As mentioned, AdX presented risks for publishers valuing brand safety. The size and importance of The New York Times business for Google explains Google's concern and prompt reaction to stop the escalation. Internal emails note that Mark Thompson, CEO of The New York Times, even met with [redacted], Senior Vice President of Ads at Google, to discuss this specific issue.[966] Similarly, The New York Times' sensitivity to ad quality is exacerbated by its position as a symbol of ethical and rigorous journalism.[967]

764. As a response to The New York Times' escalation, Google manually blacklisted and suspended accounts that propagated harmful ads.[968] However, Google's concern for quality ads is limited to a few publishers. In its internal strategy document discussing ad tech tools to protect publishers against objectionable ads, Google classifies publishers in tiers and states that it is "not building these tools for the general market of publishers."[969]

765. With Global Bernanke, Google no longer maintained a pool of excess funds per publisher but rather across publishers, ending the maintenance of a [redacted] take rate per publisher. By doing this, Bernanke harmed individual publishers' payout. Google internally acknowledged that Global Bernanke was harming some publishers, stating that "some publishers get hurt significantly."[970]

---

[965] GOOG-NE-07249237 at -238. "Re: Bernanke on Admob" (April 26, 2016). Internal email thread with [redacted], and others. ("My chief objection to Bernanke (and this is old news) however is that I believe Bernanke encourages pubs to set higher floors that they would in its absence […]")

[966] GOOG-DOJ-15084405 at -405, -409. "Fwd: NYTimes Escalation/ Next Steps" (December 14, 2016). Internal email thread between [redacted]. ("Additionally, Mark Thompson, CEO of NYT, has just mentioned that he wants to discuss this issue on a Monday meeting with [redacted]; so we have a great deal of work ahead to prep.")

[967] The New York Times. "Behind the Journalism: How The Times Works" (June 30, 2022). Accessed on June 4, 2024. https://www.nytimes.com/explain/2022/new-york-times-journalism

[968] GOOG-DOJ-15084405 at -409. "Fwd: NYTimes Escalation/ Next Steps" (December 14, 2016). Internal email thread between [redacted]. "To date we have blacklisted 191 Fake News sites […]").

[969] GOOG-DOJ-15769995 at -996. "Protecting Publishers form Objectionable Ads" (May 2017). Internal Google document on potential harmful ads for publishers. ("As mentioned above, we are not building these tools for the general market of publishers; they are aimed at the most sensitive group, those willing to take significant revenue loss in exchange for a higher degree of brand safety.").

[970] GOOG-AT-MDL-003407129 at -135. "GDN bidding dynamics" (April 5, 2018). Internal Google PowerPoint on Bernanke. ("Global Bernanke: Removes the margin constraint per publisher and uses [redacted] for all adwords * adx; Some publishers get hurt significantly, so apply bounds on the margin deviation.").

766. Global Bernanke incorporated safety mechanisms to limit its potential harm. These mechanisms were implemented so that no individual publisher's margin was less than [redacted] to guarantee that GDN didn't incur a loss on any publisher. Safety mechanisms were also employed so that publishers did not lose more than [redacted] of their expected payout.[971] However, despite these safety mechanisms, an experiment to analyze publisher payout under Global Bernanke suggested the [redacted] payout constraint did not work all the time. As indicated by Nirmal Jayaram, Senior Director of Engineering, "the [redacted] payout constraint works very well for the most part. A couple of pubs see a [redacted] revenue drop (not sensitive pubs)."[972]

767. Results of the Global Bernanke experiment show the payout impact breakdown for all publishers.[973] These results show that [redacted] of publisher payout is negatively impacted by Global Bernanke, with [redacted] of payout decreasing beyond the [redacted] margin constraint because of Global Bernanke.[974]

768. From the same experiment, it is also clear that Google differentiates between publishers and pays particular attention to "sensitive" publishers[975] to limit their harm. For instance, in the experiment results, [redacted] of the payout to sensitive publishers increased due to Global Bernanke.[976] Compared to the results for all publishers, the result for sensitive publishers suggests that while Google limited the harm on sensitive publishers, many other publishers suffered from Global Bernanke.

769. While Google was pleased that the results showed the "vast majority of sensitive pubs benefit and the few that lose are within the imposed [redacted] constraint," there was still concern regarding the overall effectiveness of the [redacted] optimization constraint. The gTrade team recognized that "the question may come up why any pub loses more than [redacted] when that was an optimization constraint."[977]

---

971 GOOG-DOJ-AT -02471194 at -194. "Global Bernanke" (July 26, 2015). Internal gTrade document on Global Bernanke. [redacted]).

972 GOOG-AT-MDL-B-002514119 at -119. "Re: Pub impact list for global Bernanke" (July 29, 2015). Internal email thread between Alok Aggarwal, Nirmal Jayaram, Johan Land, and others. [redacted]

973 GOOG-DOJ-AT -02471194 at -196. "Global Bernanke" (July 26, 2015). Internal gTrade document on Global Bernanke. The strategy document mentions that Google ran a '[redacted] experiment." I assume that this means that the experiment was run on [redacted] of the overall traffic.

974 GOOG-DOJ-AT -02471194 at -196. "Global Bernanke" (July 26, 2015). Internal gTrade document on Global Bernanke.

975 GOOG-DOJ-AT -02471194 at -196. "Global Bernanke" (July 26, 2015). Internal gTrade document on Global Bernanke.

976 GOOG-DOJ-AT -02471194 at -196. "Global Bernanke" (July 26, 2015). Internal gTrade document on Global Bernanke.

977 GOOG-AT-MDL-B-002514119 at -119. "Re: Pub impact list for global Bernanke" (July 29, 2015). Internal email thread between [redacted], and others.

770. Some publishers attempted to overcome Bernanke's secretive auction manipulation. Google's reaction to this situation was to close the "Bernanke loophole."[978]

771. The fact that publishers were paying Google more than what would arise out of the process they believed Google was following is precisely why there was harm to the competitive process. Google used its market power in sell-side tools, which meant that publishers did not have non-Google-provided tools to use to compare alternative revenue outcomes. This meant that by making pricing non-transparent, publishers would not be alert to any over-payments to Google and would not have the critical first step in being able to initiate a competitive response. Thus, it was precisely the lack of transparency that allowed Google to adopt price changes that lowered bids on queries that might have otherwise found matches on rival exchanges. In effect, it was as if Google engaged in a type of predatory pricing to deny rival exchanges volume, but instead of recoupment happening in the future when competitors exited, Google algorithmically funded the lower prices through publishers' own accounts by altering bids on queries where advertisers had higher willingness to pay for matches. The end result was that publishers had no clear view of these manipulations to initiate a competitive process to mitigate their effects, and ultimately, Google was able to steer more demand to its own exchanges. Even if that did not increase Google's average price, it did deny volume to those exchanges and potentially a means by which those exchanges could gather more information about advertisers and publishers and become a stronger long-run competitor against Google.

4) Bernanke harmed advertisers by overcharging them in low-demand auctions

772. Bernanke overcharged advertisers. An internal document describing Global Bernanke notes that "Bernanke breaks CPA targets – overcharging advertisers."[979] By overcharging advertisers, Bernanke created a pool of excess advertiser funds that could be used to subsidize GDN bids.

773. To conclude, the different versions of Bernanke took place in Google's ad buying tool for small advertisers and harmed competition in these ad tech tools. Bernanke harmed publishers by inflating bids of low-quality ads and underpaying publishers when it charged a take-rate above [redacted] At the same time, Bernanke harmed advertisers by overcharging them in low-demand auctions.

[978] GOOG-NE-03726854 at -865. "Sell-side 2.0 - VP review" (August 16, 2017). Internal Google PowerPoint on Google's access to publisher inventory. ("Pubs should not have to straddle multiple platforms in order to maximize their earnings: Close "Bernanke loophole" – edge case where pubs call AdX at a high floor to take advantage of Bernanke lowering revshare, then call AFC or AdMob as backfill to evade Bernanke recovery.").
[979] GOOG-DOJ-15472232 at -302. October 2017. "New Notes Doc" (October 2017). Internal Google notes detailing daily updates.

774. As I explained, Google explicitly stated that "the first rule about Bernanke is we don't talk about Bernanke"[980] and acknowledged that Bernanke was "borderline fraudulent".[981] The secretive nature of Bernanke is evidence of Bernanke's harm on publishers and advertisers. If Bernanke had positively impacted publishers and advertisers, Google wouldn't have been so cautious hiding it.

775. Google might argue that Bernanke benefitted publishers and advertisers by optimizing the auction and expanding output of impressions sold on AdX. I am not aware that the implementation of Bernanke led to such benefits for publishers and advertisers. Quite the contrary, as I described above, Bernanke harmed publishers by inflating bids of low-quality ads and underpaying publishers in some cases. It harmed advertisers by overcharging them in low-demand auctions. If Google suggests further benefits, I plan to evaluate such claims.

C. Dynamic Revenue Share

776. The second major project that Google employed to manipulate auction items in its own interests rather than the interests of its customers (in this case, publishers), Dynamic Revenue Share, was on the sell side of the exchange market. Rather than manipulating auction bids as was done with Bernanke, this project directly altered the exchange take rate (or payout received by publishers) for matched transactions. Otherwise, the algorithmic design was similar in process: altering take rates across transactions to increase the volume of completed transactions on AdX while maintaining take rates to a publisher on average, thereby, creating non-price transparency and making it impossible to initiate the first step of a competitive process that could constrain prices should a publisher be worse off by Google's conduct. To Google, this allowed them to engage in a predatory economic process funded by their own customers with recoupment through a banking or debt-like scheme that ultimately steered transactions from rival exchanges. These impacts of DRS harmed competition in the ad exchange market.

777. Had Google not had monopoly power on the sell side of the market or been vertically integrated into the exchange market, it would not have had the ability or the incentive to undertake this conduct that harmed competition.

[980] GOOG-DOJ-15445619 at -620. June 2017. "Re: GDN Mediation Detection AM Email Followup" – Internal Google email between [redacted]. ("We can't talk about this at all. I recognize this is frustrating and lacks an escalation path so I'll push this one more time, however I keep hitting a "the first rule about Bernanke is we don't talk about Bernanke" situation.").
[981] GOOG-DOJ-15435620 at -621. March 2017. "Re: Would FB prefer bidding into a second-price auction?" – Google internal email. ("From an intelligent bidder's POV most auctions aren't run honestly, with the level of dishonesty ranging from mild (e.g. RPO) to moderate (e.g. soft floors) to borderline fraudulent (e.g. bidder and seller see different clearing prices w/SSP pocketing the difference).").

778. The first version of DRS v1 may resemble a form of price discrimination by Google as it allowed Google to offer selective discounts on its take rate to complete transactions. This was consistent with a famous economics result by Google's Chief Economist at the time, [redacted], that price discrimination can improve social welfare so long as it leads to an increase in volume.[982] As the take rate in DRS v1 (i.e., the first version of DRS) was always equal to or lower than the existing take rate, it was effectively a price cut and as such could have increased transactions without immediate harm to competition.

779. However, Google never intended for this to be the case. Google planned the second version of DRS (DRS v2) – that did not just lower AdX's take rate selectively – when DRS v1 was launched.[983] DRS v2 and tDRS, deviated from DRS v1 in two ways. First, the discounted take rates were funded by an increase in the take rate on other auctions with the same publisher. This was achieved by accounting for discounts as a 'debt' that would need to be recouped from raising take rates on other transactions over a specified time period. Second, Google chose not to make publishers aware of the take rates for each transaction. This was an intentional choice by Google. Instead, in later implementations, publishers were given an opportunity to opt out of DRS but without proper information to make that choice.

780. While, in principle and on average, publishers would not be charged more than [redacted] by later implementations of DRS – in practice, through the mechanisms I will describe in this section, some publishers were worse off and potentially unaware of that. Moreover, the lack of transparency meant that rival exchanges could not, through publisher choice, compete by offering better take rates.[984] This subverted the competitive process.

781. If it did not have monopoly power on the sell-side, and was not vertically integrated into the exchange market, where DRS took place, Google would not have been able to or had the incentive to implement DRS in this manner. In particular, while the exchange entity may have wanted to implement the take rate price discrimination in the way it did, it would not have had the incentive to balance things out on a per-publisher basis, as AdX did in DRS v2. Similarly, the publisher ad server would not have had

---

[982] [redacted]

[983] Deposition of Nitish Korula (Engineering Director, Google). 234:24-235:5. April 19, 2024. ("Q And if we go down to the first page of the document, the one that ends in 2 -- the Bates with 241, you see the title is: AdX Dynamic Revshare v2: Launch Doc. A. Yeah Q. Before we get into this document, let me just ask when -- so, is it the case that -- that thought was already being given to -- to dynamic – to DRS version 2 when DRS v1 was launched? A. I believe that's correct.")

[984] Sovrn. "Bundled Solution Increases Yield for Publishers, Improves Efficiency for Buyers" (November 6, 2023). Accessed on June 3, 2024. https://www.sovrn.com/blog/press-release-direct-to-demand/ (Sovrn, an ad serving company, moved from revenue share to a SaaS (software as a service) model in 2023. Sam Youn, VP of Programmatic at Chegg and member of Sovrn's Ad Management Steering Committee, said that "Moving to a SaaS model for programmatic transactions not only removes revenue share fees from the auction but delivers much-needed transparency to both the sell side and buy side. Variable rev shares may benefit a particular supply-side platform in an individual auction, but ultimately obfuscates the true value of inventory for buyers and publishers. In a SaaS model, buyers know 100% of their budget goes to working media, and publishers understand the true market value of their inventory.")

an incentive to obscure the actual take rates and subvert competition between exchanges. As noted throughout this report, both the customers and sell-side tool providers that are not integrated into the exchange market have an incentive to ensure that there is maximal competition between rival exchanges.

1) Timeline and functioning of DRS

782. In this section, I outline the timeline of DRS and its implementation. I also show that DRS was implemented because of Google's market power in the publisher ad server and ad exchange markets.

a) DRS is a pricing adjustment conduct that takes place in AdX

783. DRS is a process that takes place on Google's Ad Exchange (AdX). Buyers on AdX are Google's ad-buying tools, AdWords and DV360, and third-party ad-buying tools, called Authorized Buyers.[985] Authorized Buyers are networks, trading desks, or DSPs, buying on behalf of multiple advertisers.[986]

784. AdX's pricing model is based on a revenue share (also called take rate). Before the implementation of DRS, Google usually charged a contractual take rate representing [redacted] of the bid value in each auction. The publisher received the remaining [redacted] of the bid value (net of the ad buying tools' buyside take rate).[987] AdX did not impose a buy-side fee.[988]

785. In other words, AdX only transacted queries with bids higher than [redacted] times the reserve price (i.e., [redacted]) before the implementation of DRS. The buyer with the highest bid would win the auction in AdX and would pay [redacted] times the reserve price (i.e., the second price in this case), which was lower than its original bid. The payment was then split between the publisher and AdX. Publishers would get a payout equal to their reserve price (i.e., [redacted] of the payment), and AdX would get [redacted] times the reserve price (i.e., [redacted] of the payment). The figure below shows the AdX revenue share model before DRS was implemented.

---

[985] GOOG-AT-MDL-001004706 at -728. "Ad Manager Ecosystem 101" (June 2019). Internal Google presentation introducing the ads ecosystem by gTech. ("The buyer facing side of Google Ad Exchange is called Authorized Buyers and different DSPs can connect to it using our proprietary Real Time Bidding protocol or an industry standard OpenRTB.").
[986] Google Authorized Buyers Help. "Authorized Buyers overview - Discover the basics of Authorized Buyers" (undated). Accessed on June 1, 2024. https://support.google.com/authorizedbuyers/answer/6138000?hl=en ("Buyers who act as an ad network, trading desk, or demand-side platform can buy inventory. These companies must buy on behalf of multiple advertisers.").
[987] GOOG-AT-MDL-001004706 at -742. "Ad Manager Ecosystem 101" (June 2019). Internal Google presentation introducing the ads ecosystem by gTech. ("Baseline revenue share is 80/20 which means that of every dollar an advertiser pays (Gross value), [redacted] cents go to publisher and [redacted] cents go to Google.").
[988] GOOG-AT-MDL-001004706 at -742. "Ad Manager Ecosystem 101" (June 2019). Internal Google presentation introducing the ads ecosystem by gTech. ("Ad Exchange does not impose a buy-side fee, but buy-side tools like DSPs might charge buyers their own fees.").

Figure 29

[redacted]

786. DRS was launched to enable AdX to change the per-query take rate dynamically. An internal document noted that "DRS clears queries when the highest bid is above the publisher floor [i.e., reserve price], but not quite enough above the floor to cover the [redacted] AdX revenue share. In these cases, we [Google] lower the revenue share per query as needed to increase transaction volume and increase match rate. We [Google] limit how often we reduce the margin to maintain a [redacted] average margin."[990]

787. In a later iteration of DRS, AdX charged a [redacted] take rate *on average*.[991] It "adjusts Google's revenue share more aggressively, by decreasing and increasing the Google share on different impressions, to increase the number of AdX auctions with a winning buyer while always achieving the publisher's contracted revenue share (typically [redacted] or higher for each billing period."[992]

---

[989] [redacted]

[990] GOOG-DOJ-32293103 at -103. "LAUNCHED! AdX Dynamic Revenue Share (DRS)" (August 11, 2015). Internal Google document on the launch of DRS.

[991] GOOG-DOJ-32293103 at -104. "LAUNCHED! AdX Dynamic Revenue Share (DRS)" (August 11, 2015). Internal Google document on the launch of DRS. ("V2 will introduce 1) better incentives to buyers and sellers and 2) bring back the AdX margin to [redacted] See also GOOG-NE-11913030 at -030. "Dynamic Revenue Sharing - Winning More Impressions!" (December 9th, 2019). ("To make up the revenue, Google manages to an average revenue share per publisher.").

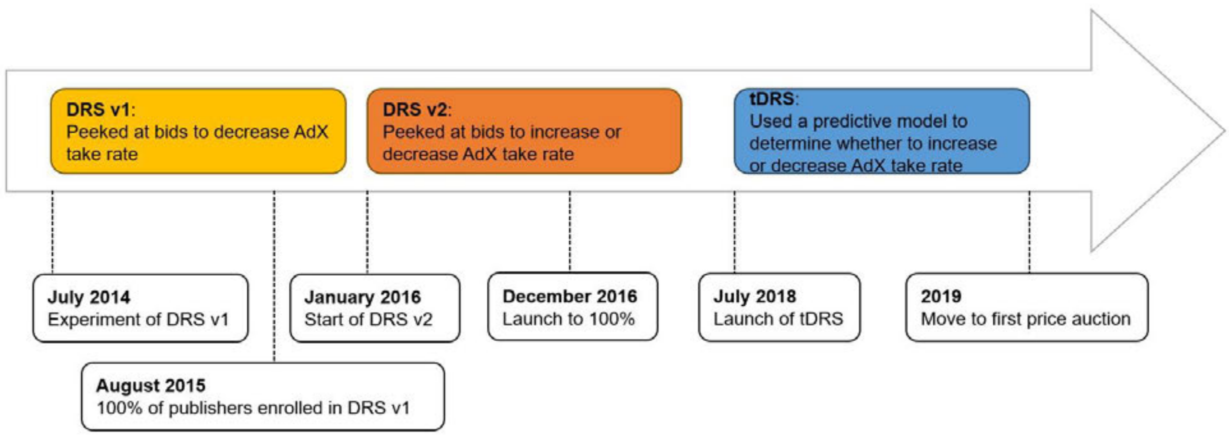
[992] GOOG-NE-04934281 at -281. "Dynamic Revenue Share" (November 26, 2019). Internal Google document on DRS. Note that billing periods may vary between contracts. Generally, a billing period spans over a month. *See* GOOG-TEX-00978421 for an example of contract. ("Company's "Monthly Service Fee for Traditional Ad Serving" is the number of Ad impressions served by Traditional Ad Serving each month multiplied by the applicable CPM rate listed above.").

788. So, AdX decreased its take rate for some impressions and increased its take rate on other impressions. In particular, it increased its take rate for auctions in which the highest bid net of the usual 20% take rate was higher than the price floor. This enabled Google to recoup the loss of revenue on the impressions where it decreased its take rate. Google kept tabs on these via what it called "debt accounts" for each publisher and each advertiser.[993]

789. DRS started in 2014 and ended in 2019 when Google switched to a first-price auction.[994] DRS was implemented in three different versions: DRS v1, DRS v2, and tDRS (truthful DRS). Figure 30 shows the timeline. Below, I discuss each version in detail.

Figure 30

DRS v1, v2, and tDRS over time[995]



---

[993] GOOG-NE-13207241 at -245. "AdX Dynamic Revshare v2: Launch Doc" (undated). Interal Google DRS launch document. ("The above intuition about DRS v2 is implemented by dynamically expanding the AdX revshare based on the debt accumulated for each buyer and each seller. The margin loss in the dynamic regions is recorded in debt accounts, and they are recollected in later auctions, effectively increasing AdX margin in later auctions beyond [redacted]

[994] GOOG-DOJ-AT -01509153 at -153. "Quality Revenue Optimizations overview" (June 2, 2020). Internal Google document that describes DRS. ("We had this feature in a second price auction … but since we switched to a first price auction in September 2019 we had to rebuild this optimization. DRS was turned off when we switched to first price and is not currently available.").

[995] For the launch dates of DRS v1, v2, and tDRS, see Google's First Am. Resps. and Objs. to Plaintiff's Third Set of Interrogs. (May 24, 2024) at 12. ("Dynamic Revenue Share launched on or about August 20, 2015. DRS v. 2 subsequently launched on or about December 1, 2016. tDRS subsequently launched on or about July 17, 2018."). Google planned to launch DRS as early as the third quarter of 2014. *See* GOOG-NE-13319630 at -630. "[Launch 121341] AdX dynamic sell-side revenue share (DRS) - full launch" (August 13, 2014). Internal Google email announcing the launch of DRS. The launch information notes the name of the launch is "AdX dynamic sell-side revenue share (DRS) – full launch," the status is "Current," and the launch date is "2014-Q3." DVS v2 was discussed as early as January 2016. *See* GOOG-NE-02338422 at -422. "AdX DRS Sync-up 2016-01-04" (January 4, 2016). Internal Google email summarizing DRS discussions. ("To avoid buyers from detecting bid/price correlation, we could have chosen not to charge first price for bids in the dynamic region. We do first pricing in v1 and current v2. We expect this to 1) be a better launch candidate that eliminates the first pricing 2) still recover lost margin as existing v2."). DRS ended in 2019 when Google switched to a first-price auction setting. *See* GOOG-DOJ-AT -01509153 at -153. "Quality Revenue Optimizations overview" (June 2, 2020). Internal Google document that describes DRS. ("We had this feature in a second price auction … but since we switched to a first price auction in September 2019 we had to rebuild this optimization. DRS was turned off when we switched to first price and is not currently available.").

b) In 2014, Google secretly launched the first version of DRS, "DRS v1"

790. Google started running experiments on live traffic in the third quarter of 2014,[996] a year before DRS v1 was fully launched.[997] DRS v1 solicited bids in the auction for an impression, peeked at the buyer's bids,[998] and then lowered AdX's take rate for that impression to guarantee AdX could win the impressions it would have otherwise lost.[999]

791. DRS v1 changed publishers' revenue share from a fixed [redacted] to a dynamic take rate varying between [redacted] and [redacted].[1000] This resulted in the average AdX take rate among all publishers being lower than the standard [redacted].[1001]

792. In DRS v1, AdX adjusted its revenue share in the dynamic region (i.e., the region between the reservation price and [redacted] times the reserve price) to ensure more queries could be cleared.[1002] Even if the bid was lower than [redacted] times the reserve price (the middle bar, [redacted]), AdX could lower its take rate to clear the query. The publisher would get their reserve price, which accounted for more than [redacted] of the bid [redacted] Figure 31 below presents the process.

[996] GOOG-NE-13319630 at -630. "[Launch 121341] AdX dynamic sell-side revenue share (DRS) - full launch" (August 13, 2014). Internal Google email announcing the launch of DRS. The launch information notes the name of the launch is "AdX dynamic sell-side revenue share (DRS) – full launch," the status is "Current," and the launch date is "2014-Q3."
[997] GOOG-TEX-00777528 at -530. "Re: [Monetization-pm] Re: [drx-pm] LAUNCHED! AdX Dynamic Revenue Share (DRS)" (September 2, 2015). Internal Google email thread about DRS revenue. ("On Wed, Sep 2, 2015, Max Loubser wrote: Last week we launched Dynamic sell-side Revenue Share (DRS) on AdX!").
[998] GOOG-NE-13226622 at -622. "Truthful DRS Design Doc" (August 5, 2019). Internal Google document on Truthful DRS ("One known issue with the current DRS is that it makes the auction untruthful as we determine the AdX revshare after seeing buyers' bids and use winner's bid to price itself (first-pricing) when the bid is within the dynamic region.").
[999] GOOG-DOJ-28339640 at -640. "Dynamic Sell-Side Revshare v1 Launch Doc" (March 2015). Internal Google launch document of DRS v1. ("By varying revshare dynamically we increase match rates on Ad Exchange by clearing more transactions that are previously not cleared because of fixed revshare.").
[1000] GOOG-DOJ-28339640 at -640. "Dynamic Sell-Side Revshare v1 Launch Doc" (March 2015). Internal Google launch document of DRS v1. ("We change AdX's revshare from fixed [redacted] (publisher's share) to dynamically vary between [redacted] and [redacted]
[1001] GOOG-NE-13207241 at -241. "AdX Dynamic Revshare v2: Launch Doc" (undated). ("In v1 the per-query AdX margin ranges [redacted], resulting average adx margin lower than standard [redacted]
[1002] GOOG-AT-MDL-013292605 at -619. "DRX Global Optimization of DRS, RPO, and EDA" (June 9, 2023). Internal Google presentation.

Figure 31

[redacted]

793. The program was only communicated internally, and by the end of August 2015, 100% of AdX publishers were enrolled in the DRS v1. When it was launched, DRS v1 had a predicted annual AdX revenue of [redacted] ([redacted] increase).[1004]

c) In 2016, Google publicly launched a new version of DRS, "DRS v2"

794. In January 2016, Google started crafting the second version of the program (v2).[1005] Publishers had the option to opt out of the program.[1006] DRS v2 was launched to 100% by December 2016.[1007]

1003 [redacted]

1004 GOOG-TEX-00777528 at -530. "Re: [Monetization-pm] Re: [drx-pm] LAUNCHED! AdX Dynamic Revenue Share (DRS)" (September 2, 2015). Internal Google email thread about DRS revenue. ("Last week we launched Dynamic sell-side Revenue Share (DRS) on AdX! It brings an additional [redacted] of annual AdX revenue, increasing AdX buyer spend by [redacted] from new queries matched. Overall match rate for AdX publishers increases by [redacted], and [redacted] when selling to AdX buyers.").

1005 GOOG-NE-02338422 at -422. "AdX DRS Sync-up 2016-01-04" (January 4, 2016). Internal Google email summarizing DRS discussions. ("To avoid buyers from detecting bid/price correlation, we could have chosen not to charge first price for bids in the dynamic region. We do first pricing in v1 and current v2. We expect this to 1) be a better launch candidate that eliminates the first pricing 2) still recover lost margin as existing v2.").

1006 GOOG-NE-04934281, at -283. "Dynamic Revenue Share" (created on May 13, 2016, and last updated on July 30, 2018). Internal Google launch document. ("In order to prevent such worry, we will provide the opt out switch if the publisher wishes to apply their revenue share on every query instead of over a billing period."). See also GOOG-DOJ-AT -01509153 at -153. "Quality Revenue Optimizations overview" (June 2, 2020). Internal Google document that describes DRS. ("DRS a network level toggle that publishers are enabled into by default but they may opt out of in settings.").

1007 Google's First Am. Resps. and Objs. to Plaintiff's Third Set of Interrogs. (May 24, 2024) at 12. ("DRS v. 2 subsequently launched on or about December 1, 2016."). *See also* GOOG-TEX-00520742 at -858. "New doc: 2018 onwards" (undated). Internal Google document. ("[DRS] should be 100% launched after Thanksgiving launch freeze.").

795. In DRS v2, Google also observed AdX buyers' bids[1008] and sometimes decreased its take rate to win an impression, but it also sometimes increased its take rate to recoup the loss incurred on other impressions.[1009] Per-query margins ranged from [redacted] to above [redacted].[1010] An internal strategy document summarized it as: "it is different [from DRS v1] because the subsidization comes from the publisher rather than Google."[1011]

796. In an internal presentation, Google explained that "[DRS] V1 decreased Google's revenue share to grow revenue overall. [DRS] V2 adjusts Google's revenue share more aggressively, by decreasing and increasing the Google share on different impressions, to increase the number of AdX auctions with a winning buyer while always achieving the publisher's contracted revenue share (typically [redacted] or higher for each billing period."[1012] The internal launch document shows that "DRS v2 is implemented by dynamically expanding the AdX revshare based on the debt accumulated for each buyer and each seller. The margin loss in the dynamic regions is recorded in debt accounts, and they are recollected in later auctions, effectively [by] increasing AdX margin in later auctions beyond [redacted]"[1013]

797. In DRS v2, AdX increased the buyer's bid in those queries with bids higher than [redacted] times the reserve price ([redacted]), to recoup the loss incurred in previous queries where the bid was lower than [redacted] times the reserve price [redacted]). Publishers were paid according to the second-highest bid, but with adjustments to account for their debt incurred in previous queries.[1014] Figure 32 shows the mechanism of DRS v2.

[1008] GOOG-NE-13226622 at -622. "Truthful DRS Design Doc" (August 5, 2019). Internal Google document on Truthful DRS ("One known issue with the current DRS is that it makes the auction untruthful as we determine the AdX revshare after seeing buyers' bids …").
[1009] GOOG-NE-13207241 at -245. "AdX Dynamic Revshare v2: Launch Doc" (undated). Internal Google launch document of DRS v2. ("We can do so by increasing the maximum revenue share from [redacted] to a higher number, and therefore the intended price set for the buyer. This can help us gain more revenue share on a subset of queries and cancel out the less-than [redacted] rev-share in other queries.").
[1010] GOOG-NE-13207241 at -245. "AdX Dynamic Revshare v2: Launch Doc" (undated). Internal Google launch document of DRS v2. ("In DRS v2, we expand per-query margin range to be [[redacted]], with an objective to keep average adx margin at [redacted] over queries").
[1011] GOOG-NE-13231861 at -861. "Enhanced Dynamic Revenue Sharing" (August 19, 2014). Internal Google strategy document explaining DRS v2. ("The idea is similar to Dynamic Revenue Sharing in that it subsidizes impressions that would not normally fill, but it is different because the subsidization comes from the publisher rather than Google.").
[1012] GOOG-NE-11913030 at -031. "Dynamic Revenue Sharing" (December 9, 2019). Internal Google presentation explaining DRS.
[1013] GOOG-NE-13207241 at -245. "AdX Dynamic Revshare v2: Launch Doc" (undated). Internal Google launch document of DRS v2.
[1014] GOOG-NE-13207241 at -245. "AdX Dynamic Revshare v2: Launch Doc" (undated). Internal Google launch document of DRS v2. ("Suppose b1, b2, r are the highest bid, second highest bid, and reserve price in the publisher space. When [redacted].").

Figure 32

[redacted]

798. The internal launch document further explained the price adjustment. It notes that "We [the technical team] recommend to launch half-way pricing [i.e., charge the buyer the average of the reserve price and the highest bid] since it has the best results in terms of revenue and profit and also it is the smallest change with respect to the current solution (DRS v1)."[1016]

799. In DRS v2, Google attached debt accounts to publishers in order to track how it could recoup the losses Google incurred by lowering its take rate on some impressions. Debt accounts were specific to each publisher and were not shared across publishers.[1017]

800. To clear more queries, Google would generate "negative revenue share" for a given impression (a revenue share below Google's [redacted] target) for AdX when the net bid (with a [redacted] take rate) was lower than the reserve price. This extra payment made by Google was added to the debt account and paid back

---

1015 [redacted]

1016 GOOG-NE-13207241 at -247. "AdX Dynamic Revshare v2: Launch Doc" (undated). Internal Google launch document of DRS v2.

1017 GOOG-NE-02338422 at -422. "AdX DRS Sync-up 2016-01-04" (January 4, 2016). Internal Google email summarizing DRS discussions. It notes that publishers sharing the same debt accounts was the result of a simulation issue and it was fixed.

in other queries.[1018] As put by a Google employee: "I think both [Bernanke and DRS] are schemes where we [Google] give up margins in some cases to win volume and recoup that loss in a different query […] DRS is for sell side."[1019] Or as mentioned in an internal document "Original DRS is considered bid manipulation. Truthful variant [tDRS] discussed after summit is more preferable from buyer's view"[1020]

d) In 2018, Google launched tDRS

801. A Google document explained that buyers had less incentive to bid their true value because of the implementation of DRS. This is because "the minimum price to beat can be lower than [redacted]], buyers have incentive to shade bids and avoid paying higher [than] [redacted]."[1021]

802. To overcome the tendency of buyers to shade their bids, Google decided to fully launch the third version of the program, truthful DRS (tDRS), in July 2018.[1022] Instead of looking at buyers' bids, tDRS used a model to predict whether a specific buyer would bid above the pre-revenue share reserve price to determine how to increase or decrease AdX revenue share before sending out bid requests.[1023] An internal document titled "Make AdX Dynamic Revshare Truthful" noted that in tDRS, "there is neither dynamic region nor first pricing. Buyers can hence bid their true value as in simple second price auction."[1024] Another document from Google summarized that "DRS v1 reduced Google's share while increasing revenue and profit, v2 brings the share back to standard for a further profit and slight revenue increase. With tDRS, we decide on Google's revenue share before setting buyer bids."[1025]

[1018] GOOG-AT-MDL-013292605 at -627. "DRX Global Optimization of DRS, RPO, and EDA" (June 9, 2023). Internal Google presentation. Interpretation from the figure in the presentation slides.
[1019] GOOG-NE-03754524 at -526. "Re: Revenue and margin" (November 11, 2016). Internal Google email thread about DRS revenue.
[1020] GOOG-AT-MDL-002332628 at -717. "DRX Quality Weekly Notes" (August 27, 2015). Internal Google notes on weekly meeting.
[1021] GOOG-DOJ-AT -02426129 at -129. "Make AdX Dynamic Revshare Truthful" (August 11, 2021). Internal Google document on improving DRS.
[1022] Google's First Am. Resps. and Objs. to Plaintiff's Third Set of Interrogs. (May 24, 2024) at 12. ("tDRS subsequently launched on or about July 17, 2018.").
[1023] GOOG-NE-13226622 at -622. "Truthful DRS Design Doc" (August 5, 2019). Internal Google document on Truthful DRS. ("We would like to adjust the adx revenue share on a per-query basis before collecting buyers' bids, disclose the adjusted pre-revshare reserve price to buyers in the bid requests fairly, and make the auction a clean second-price auction. We plan to achieve this by building a ML model to predict whether a buyer would bid above the reserve price plus original adx revshare, and lowering the adx revshare if prediction shows bid is likely to be below such threshold, before sending out bid requests.").
[1024] GOOG-DOJ-AT -02426129 at -130. "Make AdX Dynamic Revshare Truthful" (August 11, 2021). Internal Google document on improving DRS.
[1025] GOOG-NE-04934281 at -284. "Dynamic Revenue Share" (November 26, 2019). Internal document by DoubleClick AdExchange.

2) DRS harmed competition in the ad exchange market

a) Google leveraged its publisher ad server monopoly to foreclose rival exchanges via DRS

803. Google had monopoly power in the ad-serving market around the time it launched DRS (see Section V.C). Google's ad server monopoly power enabled AdX to effectively implement DRS. First, the scale of DFP and the advantages it afforded to AdX allowed AdX to participate in a wide range of auctions with different degrees of competition. Second, DRS was implemented after AdX received the DA floor, giving it an edge for how much to adjust its take rate. Third, Google's vertical integration gave it the ability to coordinate buy side and sell side dynamic take rate programs.[1026]

b) DRS increased AdX transaction volume and revenue without improving price or quality

804. Google's intended that DRS would lead to winning more high-demand impressions.[1027] DRS also fits Google's broader strategy of "winning more" and limiting the rise of Header Bidding. Google had three strategic pillars for its ad tech market dominance. The first was to "own the tag" to control ad-serving logic and access to inventory. The second was to "see more" with ad server features that would give AdX a "First Look" at impressions. The third was to "win more" with optimization algorithms, such as DRS, that increased AdX's ability to match impressions compared to third-party exchanges.[1028]

805. Google documents suggest that, with DRS, AdX was able to clear a large share of impressions in the dynamic region. For instance, upon the full launch of DRS v1, Google analyses measured a 11.6%

[1026] GOOG-DOJ-14712011, at -013. "Re: AdX Dynamic Revenue Share – requesting VP Launch Approval by email" (January 6, 2015). Internal Google email thread on DRS launch decision. ("The main risk with this ["two-sided DRS"] launch is long term buyer or seller gaming of the rev share by bidding lower or increasing floors ... To disincentivise gaming we have per-buyer and per-seller throttling mechanisms. Buyers or sellers that deviate from a pre-defined margin will be probabilistically throttled ... so that their lowered bids or raised reserves stop transacting.")

[1027] GOOG-NE-05314708 at -710-712. "Re: AdX bidding strategy to win high value imps" (December 19, 2017). Internal Google email thread on AdX bidding strategy. ("One of the ideas discussed was to algorithmically reduce Google's rev [i.e., revenue] share on high-demand impressions when we don't think we'll win them, optimizing 'net revenue' vs 'net margin.' Does DRS do this sufficiently today?" and "My impression from yesterday's meeting is that [redacted] would be willing to consider lower margins on high-value impressions (even if this were to reduce the overall margin.").

[1028] GOOG-NE-09142377 at -392. "Programmatic Update & Discussion" (October 2016). Internal Google presentation. A figure with three panels presents these three strategies.

increase in AdX publishers' match rate with AdX buyers.[1029] Google documents also demonstrate that DRS v2 led to a [redacted] increase in AdX revenue and [redacted] increase in AdX profit.[1030]

806. By changing AdX take rate, Google was able to clear transactions it would have otherwise lost.[1031] In the same document, Google shows the results of its DRS v1 1% experiments (over 11 days) and of its 10% ramp-up. The 1% experiment led to an 8.55% increase in matched queries. Google reports that the 10% ramp-up increased matched queries by 11.6%.[1032]

807. In combination with DA, DRS is most harmful to competition. Under DA, DFP allows AdX to bid on impressions that are allocated as remnant inventory before any other demand source and AdX gets to serve this impression as long as it can return a bid that is higher than the estimated bids for this impression that is based on the historical CPM that similar impressions generated. DRS then takes the floor set by DA, informed by third-party exchanges' historical bids, and adjusts AdX's take rate to selectively clear impressions.[1033] In a Waterfall setup, this means that DRS may foreclose rival exchanges from an opportunity to bid on those impressions and clear at higher prices.[1034]

808. DA gave AdX a "Last Look" over Header Bidding bids. Google enabled DFP to pass the winning Header Bidding bid to AdX as a floor price and awarded the impression to AdX as long as it could return a bid higher than that bid.[1035]

[1029] GOOG-TEX-00777528 at -530. "Re: Monetization-pm] Re: [drx-pm] LAUNCHED! AdX Dynamic Revenue Share (DRS)" (September 2, 2015). Internal Google email thread about DRS revenue. ("Last week we launched Dynamic sell-side Revenue Share (DRS) on AdX! It brings an additional [redacted] of annual AdX revenue, increasing AdX buyer spend by [redacted] from new queries matched. Overall match rate for AdX publishers increases by [redacted], and [redacted] when selling to AdX buyers.").

[1030] GOOG-NE-13234466 at -467. "Overall Pub Yield With DRS(v2)" (June 4, 2020). Internal Google document on the performance of DRS. One page of the presentation slides summarizes the overall impact of DRS on publisher revenue and AdX revenue and profit.

[1031] GOOG-DOJ-28339640 at -640. "Dynamic Sell-Side Revshare v1 Launch Doc" (March 2015). Internal Google launch document of DRS v1. ("By varying revshare dynamically we [Google] increase match rates on Ad Exchange by clearing more transactions that are previously not cleared because of fixed revshare.").

[1032] GOOG-DOJ-28339640 at -640, 641. "Dynamic Sell-Side Revshare v1 Launch Doc" (March 2015). Internal Google launch document of DRS v1.

[1033] Declaration of Nitish Korula (Engineering Director, Google), Paragraph 32, August 4, 2023. ("DRS v1 only applied when no AdX bid (net of AdX's revenue share) was above the reserve price. All versions of DRS applied in the same way whether the applicable AdX reserve price was set by a publisher-configure floor, the EDA price, or the price of a remnant line item. In most cases when DRS applied, the reserve price was set by the publisher-set floor price. In this situation where the highest bid would not meet the publisher-set floor price if Google took its full revenue share (and the transaction would therefore not happen at all), DRS allowed Google to forgo its full revenue share, enabling the transaction to proceed and the publisher to be paid.")

[1034] GOOG-DOJ-14733377 at -377. "Re: eBay US - Diagram Outlining" (August 19, 2016). Internal Google email thread on answering the questions related to DRS from the publisher eBay. (A Google employee mentioned the concerns of the publisher eBay and showed that the impressions cleared by DRS usually go to other exchanges. He states: "eBay in Europe has a waterfall setup with multiple passbacks to other SSPs (see graph below from their RFI doc). When AdX takes an impression thanks to DRS that would not have been taken by AdX otherwise, the control revenue (no DRS) would not have been zero but X from Rubicon. This reduces the actual benefit from DRS for eBay (but doesn't negate it fully).").

[1035] GOOG-TEX-00843142 at -145. "First-price bidding Update" (September 3, 2019). Internal Google presentation. ("The header bidders are called first and a first-price auction is run amongst them. This is sent as a floor to AdX.").

809. The combined effects of Last Look and DRS v2 led to revenue losses for the publishers for the following reasons. When DRS v2 led to a decrease in the take rate to clear a binding price floor generated by Last Look, which is equal to the Header Bidding winning bid, the impression is awarded to AdX;[1036] the publisher gets paid only 1 cent higher than the Header Bidding winning bid.[1037] However, the debt account associated with that publisher turns negative, which might be substantially larger than 1 cent depending on the size of the dynamic take rate adjustment. This means that the publisher will have to pay that amount back to Google in other auctions through dynamic take rate increases as a part of DRS v2 balancing its debt account for that publisher. Had this not been the case, the publisher would be getting the Header Bidding winning bid, which is only 1 cent lower than what the AdX bid would have been, but would not lose out on potentially substantial revenue in the future due to DRS v2 balancing its account. As a result, in the long run, the publishers lose revenue due to the combined effects of Last Look and DRS v2.

810. To set the ideas more concretely, consider the following example. Imagine a publisher who got a winning bid of $6 from the Header Bidding auction, net of any fees. This bid then gets transferred to DFP as a line item, and AdX uses that as a price floor when it is conducting a second-price auction for this impression due to Last Look. Further, imagine that, when initiated, the AdX auction has a price floor of $3 and elicits two bids above that price floor, $7 and $5, where neither includes the AdX take rate of [redacted] Without the effect of the DRS v2, the AdX auction would return no successful bid, and the impression would be awarded to the Header Bidding winner, and the publisher would generate a revenue of $6. This is because the AdX auction would have the effective price floor of $6 due to the Header Bidding winning bid and Last Look, and the 2 bids it generated net of the take rate would be [redacted]. Since neither of them is above the price floor of $6, the AdX auction would fail to clear and lead to the explained outcome. Now consider the effects of DRS v2. Under this take rate adjustment, AdX would decrease its take rate to [redacted] so that the highest bid would be equal to [redacted]. In this case, since the highest bid net of the exchange take rate, which is [redacted], is higher than the effective price floor, which is $6, AdX would be able to clear the impression and, in line with the second-price auction format, the clearing price would be the price floor plus 1 cent, since the second highest bid net of the exchange take rate is below the price floor. Hence, the publisher would generate revenue of [redacted].

[1036] GOOG-TEX-00843142 at -145. "First-price bidding Update" (September 3, 2019). Internal Google presentation. ("The header bidders are called first and a first-price auction is run amongst them. This is sent as a floor to AdX.").
[1037] GOOG-AT-MDL-013987096 at -102. "Publisher Monetization 101" (March 29, 2023). Internal Google presentation. An example is presented to describe the process of "last look."

However, the publisher would also incur the debt of [redacted],[1038] which it would have to pay back to AdX in another auction. In sum, without the combined effects of DRS v2 and Last Look, the publisher would gain $6 over the long run. However, with the combined effects of the DRS v2 and Last Look, it generates [redacted] in the long run, which constitutes a loss for the publisher.

c) DRS allowed Google to maintain a high overall take rate

811. Google documents show that AdX has charged around [redacted] take rate on average across open auction transactions (with the exception of brief periods of time when DRS v1 was in place).[1039] Google-produced data also shows that Google has been charging approximately a [redacted] take rate on open auctions since 2013, as show in Figure 33 below.

[1038] GOOG-NE-13207241 at -245. “AdX Dynamic Revshare v2: Launch Doc” (undated). Interal Google DRS launch document (this document presents precise formulas for these calculations for the debt accounts for DRS v2, but it abstracts away from the 1 cent differential usually paid above the price floor.).

[1039] AdX take rate is [redacted]. *See* RBB Economics, 2020, “Google’s ad tech take rates: Analysis of Google auction level data sets” (October 20, 2020). Page 6. Available at: https://www.accc.gov.au/system/files/Google%20-%20Report%20by%20RBB%20Economics%20%2813%20November%202020%29.pdf Internal documentation shows that AdX took [redacted] take rate for Google Ads and third-party buyers in 2016, [redacted] take rate for Google Ads and [redacted] take rate for third-party buyers in 2017, and [redacted] take rate for Google Ads and [redacted] take rate for third-party ad buyers in 2019. *See* GOOG-NE-05267182 at -187. “Display P&L Update - May” (May 2017). Internal Google presentation showing the take rate in 2016. GOOG-NE-03730572 at -586. “Display RevForce” (June 7, 2018). Internal Google presentation showing the take rate in 2017. GOOG-NE-02643927 at -927. “2019 DVA Waffle: Buyside Fee, Rev Share, Net Rev % & Media Spend” (October 1, 2019). Internal Google presentation slide showing the take rate in 2019.

Figure 33

[redacted]

1040 [redacted]

812. AdX's take rate has been higher than that of rival exchanges over time. Google's internal documentation confirms AdX's ability to charge supracompetitive take rates relative to other rival exchanges. A 2017 document acknowledged that rival exchanges struggled and that new entrants in the market had lower take rates.[1041] In Section IX.C, I discuss AdX's take rate trends relative to competitors.

813. AdX has the ability to price-discriminate across impressions, charging varying take rates based on the level of competition faced. The ability to charge a supracompetitive take rate for a segment of the market is direct evidence of monopoly power in those market segments. Indeed, Google had monopoly power in the exchange market. In January 2016, around the time it launched DRS v2, AdX had a [redacted] market share in the Americas in terms of indirect impressions.[1042]

814. DRS enabled AdX to adjust the take rate charged to publishers after observing AdX buyers' bids.[1043] The program enabled AdX to price-discriminate between competitive and noncompetitive impressions based on bid information and ensured AdX won more auctions than rival exchanges sending bids to DFP.[1044]

815. In DRS v2, Google peeked at a buyer's bids and either decreased its take rate to win an impression or increased its take rate in less competitive auctions to recoup the loss incurred on other impressions.[1045] The per-query margin from DRS v2 ranged from [redacted] to above [redacted].[1046] This means Google was able to charge supracompetitive prices on a per-query basis.

[1041] GOOG-NE-07272257 at -274, 275. "Sell-side strategy update" (May 30, 2017). Internal Google presentation. Bullet point in the slides show that "New entrants are lower cost" and "Many SSPs are struggling."
[1042] GOOG-TEX-00971726 at -736. "Header Bidding Observatory #2" (May 2017). Internal Google presentation detailing Header Bidding adoption. The number is from a table in the presentation slides.
[1043] GOOG-NE-13226622 at -622. "Truthful DRS Design Doc" (August 5, 2019). Internal Google document on Truthful DRS. ("One known issue with the current DRS is that it makes the auction untruthful as we determine the AdX revshare after seeing buyers' bids …").
[1044] GOOG-NE-06842133 at -148. "[March 2016] DRX Marketing Messaging" (March 2016). Internal Google communication document ("DRS: sophisticated bidding logic to encourage AdX buyers to win more AdX queries").
[1045] GOOG-NE-13207241 at -245. "AdX Dynamic Revshare v2: Launch Doc" (undated). Internal Google DRS launch document. ("The above intuition about DRS v2 is implemented by dynamically expanding the AdX revshare based on the debt accumulated for each buyer and each seller. The margin loss in the dynamic regions is recorded in debt accounts, and they are recollected in later auctions, effectively increasing AdX margin in later auctions beyond [redacted]
[1046] GOOG-NE-13207241 at -245. "AdX Dynamic Revshare v2: Launch Doc" (undated). Internal Google DRS launch document. ("In DRS v1, the per-query AdX margin ranges [redacted] resulting average adx margin lower than standard [redacted] In DRS v2, we expand per-query margin range to be [redacted] with an objective to keep average adx margin at [redacted] over queries.").

816. Google has produced GAM (Google Ad Manager) bid-level auction data for US web impressions.[1047] For each auction the data contains all winning and losing bids, the transaction type for each bid, as well as the DSP used to place the bid. I have analyzed a sample of [redacted] auctions randomly selected from this data[1048] showing that Google Ads won around [redacted] auctions it participated in. Of the [redacted] auctions that Google Ads participates in but does not win, about [redacted] are won by DV360.

817. I measure the competitiveness of auctions in two different ways. First, I calculate the number and share of auctions in which Google Ads is the sole participant. I find that in 7.7% of auctions where Google Ads won, Google Ads was the only participant. In those auctions, Google's ad tech tools have the flexibility to raise take rates as much as needed without any risk of losing the impression to a competitor.

818. Google data shows a breakdown of the [redacted] won by Google Ads. In about [redacted] of those auctions, Google Ads is the only participant. In approximately 50% of those auctions, the second highest bid was from DV360. In roughly [redacted] of the auctions with Google Ads winning and DV360 providing the second highest bid, Google Ads and DV360 were the only participants. Finally, in approximately [redacted] of auctions won by Google Ads, the second-highest bid was from a non-Google ad buying tool.[1049]

819. Second, I measure the competitiveness of the auctions by the average number of competing bids for each auction. I find that auctions won by Google Ads received, on average, 5.0 bids, while auctions where Google Ads participates but loses received 6.9 bids on average.[1050] This also indicates that Google

---

[1047] GAM log-level bid data produced for the U.S. Department of Justice. It includes GAM auctions for U.S. web impressions (based on user location) won by AdX bidders, Open Bidders, and remnant line items. The data contains all the queries and bids in March 2022.

[1048] GAM log-level bid data produced for the U.S. Department of Justice. It includes GAM auctions for U.S. web impressions (based on user location) won by AdX bidders, Open Bidders, and remnant line items. The data contains all the queries and bids in March 2022. A sample of 100 million queries where the winning bid is transacted via "Open Auction" or "Open Bidding" are randomly selected for the analysis. After the filtering, all query-bid level data is aggregated to the query level. All queries are further classified into three categories: "Google Ads won", "Google Ads participated but lost", and "Google Ads did not participate." Then the aggregated query-level data is further aggregated by the defined category.

[1049] GAM log-level bid data produced for the U.S. Department of Justice. It includes GAM auctions for U.S. web impressions (based on user location) won by AdX bidders, Open Bidders, and remnant line items. The data contains all the queries and bids in March 2022. A sample of 100 million queries where the winning bid is transacted via "Open Auction" or "Open Bidding" are randomly selected for the analysis. After the filtering, all query-bid level data is aggregated to the query level. All queries are further classified into three categories: "Google Ads won", "Google Ads participated but lost", and "Google Ads did not participate." Then the aggregated query-level data is further aggregated by the defined category, and the following statistics are calculated: the average number of bids by category, the number of queries Google Ads is the sole bidder, the number of queries the second highest bid comes from DV360, and the number of queries where DV360 and Google Ads are the only bidders.

[1050] GAM log-level bid data produced for the U.S. Department of Justice. It includes GAM auctions for U.S. web impressions (based on user location) won by AdX bidders, Open Bidders, and remnant line items. The data contains all the queries and bids in March 2022. A sample of 100 million queries where the winning bid is transacted via "Open Auction" or "Open Bidding" are randomly selected for the analysis. After the filtering, all query-bid level data is aggregated to the query level. All queries are

Ads often competes in auctions that are not as competitive, allowing it to charge a higher take rate in those auctions.

820. Prior to the launch of DRS, take rates across demand sources buying on AdX were generally equivalent. However, as depicted in Figure 34 below, analyses performed on Google-produced data show that DRS resulted in higher take rates on winning bids placed by Google Ads demand sources relative to bids placed by RTB and DV360 demand sources. The higher take rates on impressions sold through Google Ads subsidized lower take rates on more competitive queries. AdX was able to achieve the impression scale needed to implement DRS through its exclusive access to Google Ads demand.

Figure 34

further classified into three categories: “Google Ads won”, “Google Ads participated but lost”, and “Google Ads did not participate.” Then the aggregated query-level data is further aggregated by the defined category, and the average number of bids in each query is calculated.

[redacted]

821. A 2015 presentation shows that Google had sufficient scale to raise its take rate on 30% of bids to offset lowering its take rate on only 6% of impressions.[1052] Thus, the scale of impressions transacted through AdX enabled DRS to balance each publisher account and ensure that contractual take rate agreements were observed.[1053]

1051 [redacted]

1053 Google's internal document and contractual language indicate that revenue-share is averaged over a monthly billing period. A strategy document updated between 2016 and 2018 shows that DRS will achieve "the publisher's contracted revenue share (typically [redacted] or higher for each billing period." *See* GOOG-NE-04934281 at -281. "Dynamic Revenue Share" (July 2018). Internal Google launch document about DRS and external talking points. Contracts also indicate that revenue shares are attributable to a calendar month. For instance, Gannett's 2017 contract with Google states: "Google will pay Company an amount

822. The 2015 internal presentation also shows that 6% of the "bids" on AdX cleared the price floor but were not high enough to take a full [redacted] take rate, so DRS could be implemented to lower the take rate.[1054] It also notes that 30% of bids on AdX cleared the price floor and were high enough to take a full [redacted] take rate so that DRS could raise its take rate. This shows that Google was able to leverage its market power and scale to raise its take rate on 30% of bids to offset lowering its take rate on only 6% of impressions. In 2016, Google assessed that around [redacted] of AdX impressions would be affected by DRS.[1055]

823. Google made use of its ad exchange's scale to balance DRS pool. This can be seen through how AdX's take rate varied across types of inventories due to DRS. Google increased its take rate for mobile app requests after the release of DRS v1, as shown in Figure 35 below. Before the release of DRS v1, take rates for mobile app requests and non-mobile app requests were equal at around [redacted] In the month when DRS v1 was released, AdX's take rate for mobile app requests increased to [redacted] and stayed around [redacted] until the DRS v1 was fully launched. Google used its market power to recoup losses from DRS by increasing the take rate for mobile app requests. Google's more aggressive take rates on mobile app requests resulted in publishers being charged more than [redacted] across mobile and non-mobile requests.

---

equal to the Revenue Share Percentage of Net Ad Revenues attributable to a calendar month." *See* GOOG-TEX-00978421 at -432. "ORDER FORM - DFP PREMIUM AND ADX SERVICES" (February 28, 2017). Gannett Co., Inc. contract with Google.
[1054] GOOG-AT-MDL-004436720 at -727. "Dynamic Revenue Sharing: V1 + V2" (May 29, 2015). Internal Google presentation on DRS v1 and v2.
[1055] GOOG-NE-04934281 at -287. "Dynamic Revenue Share" (July 2018). Internal Google launch document about DRS and external talking points. ("What percentage of impressions will be affected by DRS on average?" "If launched fully to all publishers, about ~8% of AdX of impressions happen due to DRS.").

Figure 35

[redacted]

824. Figure 36 below shows the number of publishers that were being charged take rates higher than [redacted] across mobile and non-mobile requests. Before DRS, no publisher was charged above [redacted] and the take rates were equivalent for mobile and non-mobile requests. The month DRS v1 is launched, hundreds of publishers were charged more than [redacted] The number of publishers charged more than [redacted] increases over time after the DRS v1 launch.

1056 [redacted]

Figure 36

[redacted]

825. Other players in the market did not benefit from such market power and were thus not able to price discriminate in a similar way. Some exchanges charged dynamic rates; however, these dynamic rates significantly differed from DRS. For example, the rival exchange Index Exchange introduced the

---

1057 [redacted]

program Exchange Fee Reduction (XFR) in 2020.[1058] XFR reduced the take rate charged to publishers based on the volume of impressions purchased by the advertiser.

826. Thus, rival exchanges were not able to implement systematic price discrimination on a per-impression basis at the same scale as DRS. Only Google had the scale and information advantage from its visibility into the floor price needed to quickly recoup losses on subsidized impressions and the ability to use its exclusive access to Google Ads demand. Other exchanges did not benefit from this market power and could not price-discriminate to the same extent.

827. In a Google email thread, a Google employee admits that DRS enables Google to not lower its margin. He explains: "DRS does matter, because that's why lowering the margin doesn't result in more impressions (i.e. matched queries). If there were no DRS, then lowering the margin could result in us clearing more queries, and making up in volume what we lose in revenue or margin per query. But with DRS, we're clearing all queries we possibly can, so we don't clear any more, and lowering margin means we just give up net revenue."[1059]

3) DRS harmed publishers

828. Google intentionally omitted telling publishers that they were enrolled in DRS. Internal documents highlight that publishers should not be aware of DRS. Notes from a November 2014 meeting state: "This is 'secret sauce,' buyers and pubs could notice it, but we have mechanisms in place to prevent that it can be manipulated." The notes go on to describe, "IMPORTANT: We should not talk about this externally, there is nothing Sales can do about it, no optimization, etc. So, in the Americas the product specialist team has decided to NOT distribute this info further to vertical leads […]."[1060]

829. An internal presentation from May 2016 shows Google's awareness of its deceptive practices. An internal document states that Google "need[s] to communicate" about optimizations (RPO and DRS) since "DoubleClick Ad Exchange has been positioned as 'transparent' until now" but that "optimizations are getting close to contractual limits" and that "buyer scrutiny may lead to external discovery and uncontrolled press coverage."[1061]

[1058] Index Exchange. "Reflecting on the Economics of Programmatic" (March 18, 2020). Accessed on June 2, 2024. https://www.indexexchange.com/2020/03/18/exchange-fee-reduction-xfr/
[1059] GOOG-NE-03754524 at -526. "Re: Revenue and margin" (November 11, 2016). Internal Google email thread about DRS, revenue, and take rates.
[1060] GOOG-NE-12737317 at -318. "[Follow up] DRX Suite Commercialization" (November 13, 2014). Internal Google internal email.
[1061] GOOG-NE-06842715 at -719. "AdX Auction Optimizations – DRS Readiness" (May 10, 2016). Internal Google internal presentation. Slide 5, 7 by gTech.

830. Google acknowledges that this could be a misrepresentation to publishers. A presentation flags "legal risks with DRS v2" and the "risks" of DRS as being "trust on commercial terms; ask for detailed report of revshare [revenue share]; never ending asks for lifts reports if offered; huge effort if we want to opt pubs back in."[1062] Google also acknowledged the vagueness of its contracts by saying: "From a legal perspective, pubs might interpret that our rev share applies on a per-query basis, even though we are not saying that in contracts." And "with DRS we are worried about pubs freaking out about the fact that rev share applies on a per query basis."[1063]

831. Google's omission around DRS led to an apprehension of having clients realize they have been deceived.[1064] More importantly, as described in detail in the sections below, by concealing DRS to publishers, Google prevented publishers from making informed decisions. Publishers could not make appropriate decisions when setting their floors to keep low-quality ads off their properties.

832. Internal documents show Google's uncertainty around the value of DRS and its reluctance to communicate that value to publishers.[1065]

833. Internally, DRS simulations did not show guaranteed revenue improvement for publishers: "Whether DRS actually makes more money for publishers? Will not know for sure but we may be able to bound the worst-case scenario (publishers provided lower average prices that they receive from third-party exchanges."[1066] Another employee even states that DRS v1 "is not always good for pubs, but 'ethically appropriate.'"[1067]

[1062] GOOG-NE-06842715 at -719, 721. "AdX Auction Optimizations – DRS Readiness" (May 10, 2016). Internal Google internal presentation. Slide 5, 7 by gTech.
[1063] GOOG-NE-06860424 at -439. "Meeting Notes: DRX Suite Commercialization" (June 16, 2016). Internal Google document.
[1064] GOOG-NE-13395146 at -147, 148. "Re: RTB buyer numbers and Quality launched" (May 9, 2017). Internal Google internal email thread. ("We don't think it's RPO. Criteo definitely noticed something, though, as they expressed in QBP. […] A DRS change (v2 launch) may also be related to one of their observations, but we're not sure […] This sounds like both Criteo and Quantcast have noticed something.")
[1065] GOOG-TEX-00107284 at -370. "Meeting notes – DRX Indirect Commercialization" (October 10, 2018). Internal Google document. ("AMS have access to the dashboard and see the total rev number of all of DRS and not the incremental number. So they make the assumption that the entire opportunity from the dashboard is the potential revenue. They use the number to tell the pubs what the incremental rev opportunity is. The risk is that if we tell pubs the actual number it might be much less attractive as a feature to opt in for.")
[1066] GOOG-AT-MDL-002332628 at -687. "DRX Quality Weekly Notes" (August 27, 2015). Internal Google notes on weekly meeting.
[1067] GOOG-DOJ-15472232 at -298. "NEW NOTES DOC" (October 16, 2017). Internal Google notes detailing daily updates.

834. Even when publishers questioned the value of DRS, Google further misrepresented the value of the program to publishers. This is made clear through weekly meeting notes about publishers that have opted out:[1068]

835. Google decided to limit the information it provided to publishers: "There will be an internal dashboard to check performance impact. But we probably won't want to do an aggressive pitch to clients to get them opted in. […] Why will we not build external reporting around DRS? The goal is mor an incremental improvement over time […]"[1069]

836. Google represented that DRS increased publishers' yield, but some publishers are worse off because of DRS, especially those smaller publishers.

837. When Google launched DRS v2, it publicly represented that its revenue share optimizations increased publishers' yield and that, on the contrary, not taking part in the program would decrease publishers' revenue. In an internal document discussing the commercialization of DRS, Google outlines a "reactive messaging (approved for written & reactive communication)." This message states: "If you don't check the box in the admin, Ad Exchange may increase or decrease revenue share per query to increase overall payout. In all cases, we keep your revenue share to your contracted share or more over a billing period. If you check the checkbox, each ad request from this network to Ad Exchange will pay at least the contracted revenue share. Selecting this disables revenue share based optimization and reduced Ad Exchange yield."[1070]

838. This document also adds the following comment "external talking points (verbal & reactive only)": "our goal has always been to help publishers and advertisers thrive and create sustainable businesses. For many years Google has used optimization and machine learning techniques to improve the performance of our ads products, and now we're happy to share that we've been extending those techniques to DoubleClick Ad Exchange customers. […] We think there are better ways to increase publisher yield. By using machine learning optimizations we plan to help publishers reduce the complexity of their ad technology setups by helping them make the most revenue possible from

---

[1068] GOOG-TEX-00107284. at -370. "Meeting notes – DRX Indirect Commercialization" (October 10, 2018). Internal Google document. ("Allrecipes: They don't want to favor AdX over other 3p providers. [redacted] asked [redacted] to try and clarify. [redacted] They don't trust us so they don't want to be opted in. Is [redacted] meeting with them?")
[1069] GOOG-NE-06860424 at -439. "Meeting Notes: DRX Suite Commercialization" (June 16, 2016). Internal Google document.
[1070] GOOG-NE-04934281 at -286. "Dynamic Revenue Share" (July 2018). Internal Google launch document about DRS and external talking points.

DoubleClick Ad Exchange."[1071] Similarly, it states, "You may choose to opt out of revenue share based optimizations in the AdX UI. If you opt-out we will apply your contracted revenue share to every Open Auction query and your will not benefit from the increased revenue from this optimization" [1072] Google made clear that an increase in publishers' yield should be a key talking point: "We should only talk about the opt out and increasing or decreasing revenue share per query in order to maximize revenue."[1073]

839. However, these statements were misleading. Although DRS could increase the volume transacted by publishers, it could also harm them due to the opportunity cost of clearing a bid at a lower price, reduced take rate competition in the long run, and an increase in low-quality ads on publishers' properties, leading to inferior user experience and a long-term decrease in revenue. These harms are discussed in more detail below.

840. DRS made some publishers worse off. In a 2016 experiment, Google acknowledged that DRS v2 led to lower revenue for some publishers. In particular, Google looked at top publishers and compared the lift of DRS v2 with respect to no-DRS. It notes that from the top 100 publishers, eight publishers saw their revenue decrease by around 1%.[1074]

841. A 2017 email summarizes: "Because we already allow publishers to opt out of DRS, we probably need to break out by family at least for DRS so publishers can understand whether they should opt in or out of it. For some optimizations, many publishers will be winners, but some will be losers (at least on some slices of inventory). We need to decide which they can opt out of besides DRS if they don't like what they see. We haven't previously let publishers opt out of EDA, RPO, ECO, so we will need to expose opportunities to get them to opt back in if it later becomes good for them."[1075]

842. More importantly, DRS v1 and v2 increased the average monthly take rate charged to some publishers. Prior to the launch of DRS, take rates were the same across AdX web properties. Data analyses show that after the launch of DRS v1, the take rates across web properties became highly variable. Some web properties incurred a substantial average monthly rate increase of much more than

---

[1071] GOOG-NE-04934281 at -285. "Dynamic Revenue Share" (July 2018). Internal Google launch document about DRS and external talking points.
[1072] GOOG-NE-04934281 at -285. "Dynamic Revenue Share" (July 2018). Internal Google launch document about DRS and external talking points.
[1073] GOOG-NE-04934281 at -281. "Dynamic Revenue Share" (July 2018). Internal Google launch document about DRS and external talking points.
[1074] GOOG-NE-13203712 at -716. "Does DRS make more money for publishers?" (undated) Internal Google document discussing the impact of DRS on publishers' revenue. ("From the top 100 publishers, 92 improved their overall revenue at least one day among the two days. For the 8 that had their revenue decreased, the decrease was around [redacted]
[1075] GOOG-NE-13390027 at -033. "Fwd: Roxot" (February 16, 2017). Internal Google email thread discussing what the publishers actually see.

[redacted] Figure 37 below shows that DRS made the previously constant AdX take rate highly variable across web properties after its launch.

Figure 37

[redacted]

843. DRS v1 even appeared to have raised – not lowered – the take rate charged by AdX for several publisher web properties, even though Google's internal document and contractual language indicate that revenue share is averaged over a monthly billing period.[1077]

1076 [redacted]

844. Prior to the launch of DRS, take rates across AdX publishers were equivalent. However, analysis from Google produced data, shown in Figure 38 below, indicates that after the launch of DRS v1, smaller publishers often faced higher take rates relative to larger publishers. This trend was accentuated as 100% of publishers were enrolled in DRS v1. So, DRS applied higher take rates to smaller publishers. This indicates that Google tended to subsidize larger publishers. As larger publishers may be associated with higher-demand impressions, by charging larger publishers a lower take rate relative to small publishers, AdX was probably able to win over more high-demand impressions.

[1077] GOOG-NE-04934281 at -281. "Dynamic Revenue Share" (July 2018). Internal Google launch document about DRS and external talking points. ("the publisher's contracted revenue share (typically [redacted] or higher for each billing period."); Contracts also indicate that revenue shares are attributable to a calendar month. See GOOG-TEX-00978421 at -432. "ORDER FORM - DFP PREMIUM AND ADX SERVICES" (February 28, 2017). Gannett Co., Inc. contract with Google. ("Google will pay Company an amount equal to the Revenue Share Percentage of Net Ad Revenues attributable to a calendar month.")

Figure 38

[redacted]

845. This harm to a publisher is especially true for specific types of inventories. As I explained previously, Google increased its take rate for mobile app requests after the release of DRS v1. Before DRS v1, take rates for mobile app requests were stable at around [redacted] After the launch, AdX's take rate for mobile app requests increased to [redacted] until the launch of DRS v2. So, Google increased its take

1078 [redacted]

rate on mobile app requests and caused harm to publishers across inventory types, such as mobile app ads.[1079]

846. Omitting to disclose to publishers that they were enrolled on DRS meant that Google overrode publishers' floor-setting strategy without their knowledge. By artificially making net bids via AdX more competitive, DRS created the risk of lower-quality ads winning without publishers being aware of it and without them being able to implement or adjust their strategies.[1080]

847. Many Google employees shared their uncertainty around the claim that DRS could increase publisher's revenue and their concern that DRS might harm publishers due to the opportunity cost to publishers.[1081] DRS's interaction with DA exacerbates the publisher harm from DA resulting from the discrepancy between the AdX floor and the publisher's true opportunity cost associated with live bids from other demand sources.

848. Indeed, DRS can adjust AdX rate and win a bid that could have cleared at a higher price in another exchange. In a Waterfall context, if AdX was ranked higher than another ad exchange with a higher bid, the publisher would receive a lower payout than it could have without DRS. This opportunity cost can harm the publisher financially as DRS adjusted take rate can lower the payout on a per-impression basis.[1082]

849. eBay was an example of a publisher worried about the opportunity cost caused by DRS. In a 2016 meeting, eBay asked a Google employee how DRS would factor into its Waterfall set-up.[1083] Google explained that DA mitigated the opportunity cost because DA matched the potential revenue a publisher

[1079] GOOG-DOJ-32280412 at -448. "Meeting: DRS Sync" (September 12, 2016). Notes of internal Google meetings on DRS.
[1080] Publishers use price floors to control the quality of ads showing on their webpage. For example, see GOOG-NE-06732710 at -715. "DFP Fees on Google-monetized impressions" (July 9, 2012). Internal Google presentation. ("[Publishers] consider reserve pricing from the perspective of ensuring that they are not cannibalizing demand for their directly sold inventory and/or attempting to keep cheaper advertising off their site.")
[1081] GOOG-TEX-00309326 at -327. "Re: Planning for 2sided rev-sharing launch" (December 10, 2014). Internal Google communication email thread about DRS launch. ("Here's another concern (that at least I haven't seen addressed) with some of the DSR proposals where the publisher says: This can result in less revenue for the publisher, because we don't take into account their opportunity cost from serving unfilled impressions elsewhere. (The WWW paper with Renato Gomes talks about this a bit.) In particular, if the reserve price is coming from a remnant ad, then increasing fill rate by matching (some impressions) below their remnant CPM is a clear revenue loss for the publisher.")
[1082] GOOG-DOJ-14717520 at -522. "Re: DRS makes more money for DFP publishers?" (March 22, 2016). Internal Google email thread on the impact of DRS on publishers. ("Let's take your example, where Rubicon is booked at an average price of $2. With our revshare at 20% we raise the reserve price to $2.50. […] The interesting case is if the highest AdX bid is $2.25. Then, with DRS, the AdX auction clears, and the publisher gets $2. In the pre-DRS world, the auction wouldn't clear. If the highest Rubicon bid is $3, the publisher makes less money ($3-$2) on this query due to DRS.")
[1083] GOOG-DOJ-14733377 at -377. "Re: eBay US - Diagram Outlining" (August 19, 2016). Internal Google email thread on answering the questions related to DRS from the publisher eBay. ("*eBay question*: eBay in Europe has a waterfall setup with multiple passbacks to other SSPs (see graph below from their RFI doc). When AdX takes an impression thanks to DRS that would not have been taken by AdX otherwise, the control revenue (no DRS) would not have been zero but X from Rubicon. This reduces the actual benefit from DRS for eBay (but doesn't negate it fully).").

could have received from other exchanges.[1084] However, as described in Section VII.B, DA relied on historical data rather than live data. This means that the opportunity costs of DRS could persist even with DA if the historical data point was lower than the actual live bid.

850. In a 2016 email thread, Google further discussed the opportunity costs linked to DRS. It explained that publishers can be worse off if their declared opportunity cost is lower than the real opportunity in other exchanges.[1085] In other words, if publishers' AdX floor is not representative of their actual opportunity cost, then DRS is harmful to publishers.

4) DRS harmed advertisers

851. Google represented that its auction as sealed and second-price.[1086] However, DRS did not function as advertised. In DRS v1, the winner is charged 1.25 times the reserve price, not the second-highest bid. In DRS v1 and DRS v2, Google peeked at buyers' bids before changing its take rate and charged the advertisers higher than the second-highest bid.

852. A 2014 email thread shows that Google internally recognized that "All the dynamic revshare schemes proposed/implemented are in effect combining a reduction in the effective floor price with elements that push the buy-side away from a clean incentive compatible second-price auction."[1087]

853. Google internally recognized that DRS v2 can make the auction untruthful because "we [Google] determine the AdX revshare after seeing buyers' bids and use winner's bid to price itself (first-pricing) when the bid is within the dynamic region," and "this could incentivize buyers to bid strategically instead of truthfully to achieve better ROI and has been the key concern preventing AdWords and DBM from using DRS."[1088]

[1084] GOOG-DOJ-14733377 at -377. "Re: eBay US - Diagram Outlining" (August 19, 2016). Internal Google email thread on answering the questions related to DRS from the publisher eBay. ("Comment from Max_ DRS will benefit eBay even when considering the "opportunity cost" from other exchanges (say, X from Rubicon). Due to dynamic allocation, X will be used as the floor in the auction when Rubicon is competing. We always pay at least the floor. So if DRS clears a query that would not have cleared otherwise, eBay will be paid at least X. ").

[1085] GOOG-NE-13369624 at -630. "Re: DRS makes more money for DFP publishers?" (March 17, 2016). Internal Google email thread on the impact of DRS on publishers. (In Scenario 2 where "publisher's declared opportunity cost is lower than the real opportunity in other exchanges," the document claims that "DRS V1 is worse for publisher compared to No-DRS; DRS V2 is better for publisher compared to DRS V1; DRS V2 is incomparable to no-DRS.").

[1086] Google Ad Manager. "Simplifying programmatic: first price auctions for Google Ad Manager" (March 6, 2019). Accessed on June 1, 2024. https://blog.google/products/admanager/simplifying-programmatic-first-price-auctions-google-ad-manager/?_gl=1*k3zp4v*_ga*MTk1MjA4MTcwOS4xNzA1MjAwMDMx*_ga_KDB2CE5G3Y*MTcxNzQ1NjQ2MC41LjEuMTcxNzQ1NjQ4OC4wLjAuMA.

[1087] GOOG-DOJ-14879034 at -035. "Re: Report on the two-sided dynamic revenue sharing" (December 10, 2014). Internal Google email thread about DRS.

[1088] GOOG-NE-13226622 at -622. "Truthful DRS Design Doc" (August 5, 2019). Internal Google document on Truthful DRS.

854. Google even considered charging the highest bid (first price) to maximize its profits. A 2015 email thread shows that Google realized there was extra profit between the highest bid and the price they charged at that time (i.e., post-revenue-share reserve, [redacted] times the reserve price). The thread also shows that Google was aware that this was deceptive and could lead to a "PR backlash."[1089]

855. To conclude, DRS takes place on Google's ad exchange and also harmed competition in the ad exchange market. DRS harmed publishers by lowering floors for low-quality ads. DRS also caused advertisers to pay more for some impressions by misrepresenting the sealed second-price auction.

856. Google might argue that DRS benefitted publishers and advertisers by optimizing the auction and expanding output of impressions sold on AdX. I am not aware that the implementation of DRS led to such benefits for publishers and advertisers. Quite the contrary, as I described above, DRS harmed publishers by reducing the effectiveness of monetization of their inventory by manipulating net bids in ways that can make low-quality ads more likely to win auctions, and decreasing their yield in those cases. It harmed advertisers by increasing the price of inventory in some auctions. If Google suggests further benefits, I plan to evaluate such claims.

IX. GOOGLE'S ANTICOMPETITIVE CONDUCT MAINTAINED AND INCREASED MARKET POWER AND HARMED CONSUMERS AND END USERS

857. This report has evaluated specific conduct of Google individually and assessed their anticompetitive intent and effect. However, there are many common threads across each of them that, in my economic opinion, together form a cumulative anticompetitive intent and effect. Therefore, in this final section of my report, I outline those common threads so as to ensure that the forest is not missed while examining the trees.[1090]

858. The focus on this report has been on four markets: the market for publisher ad servers used for the sale of open web display advertising space (ad server market); the market for ad exchanges for transacting

[1089] GOOG-DOJ-14880607 at -607. "Re: DRS review summary notes - please check" (February 18, 2015). Internal Google email thread about reviewing DRS implementation details. ("The main argument I see for giving buyers a small noisy auction discount is to ward off a PR backlash.").

[1090] This analysis also sits within the context of economic analysis that emphasizes the importance of competition and its foundations to generate broad economic efficiency and prosperity (see, for example, Fiona Scott Morton, "Why you should care about antitrust," 2020, https://insights.som.yale.edu/insights/why-you-should-care-about-antitrust. A hallmark is the fundamental theorems of welfare economics that draws an equivalency between the promotion of competition, and in particular competitive prices that reflect economic value, and economic efficiency that ensures that scarce resources are being allocated to those who can derive the most value from them; see Hal Varian, Microeconomic Analysis, Vol.3, New York: Norton, 1992, Chapter 17; Paul Milgrom and John Roberts, Economics, Organization and Management, New York: Prentice-Hall, 1992, Chapter 3; and Makowski, Louis, and Joseph M. Ostroy. "Perfect Competition and the Creativity of the Market." *Journal of Economic Literature* 39, no. 2 (2001): 479-535.

indirect open web display advertising space (ad exchange market); the market for ad-buying tools for small advertisers for buying open web display advertising space (ad buying tool market for small advertisers); and the market for ad-buying tools for large advertisers for buying open web display advertising space (ad buying tool market for large advertisers). In section V, I demonstrated that Google has monopoly power in the ad server market, the ad exchange market, and the ad buying tool market for small advertisers.

A. Google's conduct enhanced Google's monopoly power

859. I next showed that Google engaged in certain conduct that enhanced this monopoly power in one or more of these markets:

- In Section VI, I described how Google tied Google Ads to AdX via technical restrictions so that publishers could only get real time access to Google's exchange by using its ad server. This increased Google's market power in the ad server market. Google later imposed a contractual tie between DFP and AdX that terminated third-party ad server access to AdX completely.

- Google then used its ad server monopoly power to preferentially channel transactions to its exchange in the four different ways below. Chronologically, the process unfolded as follows:

    - Google introduced DA, followed later by EDA, in a manner that impaired real-time competition between exchanges and increase transactions on AdX compared to what a competitive provider of ad server tools would do if it was not vertically integrated. This strengthened Google's monopoly in the exchange market (see Section VII.B).

    - Google restricted publisher's use of line items, which limited publishers' use of Header Bidding. Header Bidding threatened Google's monopoly power in the ad exchange market and this limitation protected its monopoly power (see Section VII.C).

    - Google then introduced UPR. This restriction on publishers that thwarted the ability of publishers to apply competitive pressure from rival exchanges to AdX, thereby expanding and maintaining Google's monopoly power in the exchange market (see Section VII.A).

- At the same time that Google introduced UPR, Google redacted key publisher data fields that prevented publishers from evaluating and comparing the performance of their inventory across different exchanges. Data redaction also preserved Google's ad exchange monopoly power (see Section VII.D).

- Google used manipulations of the auction run by its buy-side tool for small advertisers and the auction run by its ad exchange respectively to exclude competitors from transacting high-value impressions.

  - Bernanke changed bidding behavior in Google's ad buying tool for small advertisers so that GDN won more transactions at the expense of rivals on AdX (see Section VIII.B). Being able to move those transactions to Google's own tool meant that other ad buying tools would have less transaction data that could be used to refine their bidding algorithms. This reduced the strength of the competitive pressure rivals could generated against Google.

  - DRS altered take rates across transactions and increased the volume of completed transactions on AdX (see Section VIII.C). DRS reinforced AdX's market power and artificially further raised barriers to entry in the ad exchange market due to the existence of network effects. DRS relied on Google's ad server monopoly power to the extent that this algorithm occurs after Google's ad server communicates rival exchanges historical performance to Google's exchange – and no other exchange – via Dynamic Allocation. Google then did not compete on the merits for those impressions.

860. I understand that each of the above anticompetitive conduct of Google form the bases for the remedies sought by the Plaintiff States in this case, including certain Plaintiff States' request for civil penalties under their respective state antitrust or unfair competition laws.

B. Many of Google's actions aimed to reduce the procompetitive innovation of Header Bidding

861. From an economic perspective, it is remarkable how much of Google's conduct described above also aimed, in whole or in part, at limiting publishers' use of Header Bidding. Header Bidding was initiated by publishers as the consumers of ad tech to enhance their competitive options. Essentially, Google's intent was to hobble these procompetitive efforts because efforts threatened Google's monopoly power and reduced Google's profits.

862. From the conduct I summarize above, the following corresponded to Header Bidding as the industry attempted to create choice and innovate away from Google's ad tech stack or Google's intent to stifle Header Bidding.

- **DA**: Publishers reacted to Google's use of DA to maintain a last look advantage over other sources of demand by developing Header Bidding. Due to the way Header Bidding was implemented, Google was able to maintain a last look advantage over Header Bidding as well (see section VII.B). Google's last look over Header Bidding harmed competition by foreclosing rival exchanges from the ability to compete on equal footing for the ability to transact impressions. Google could have given publishers the choice of who had a last look but did not.

- **Line item limitations**: As publishers started adopting Header Bidding widely, Google used line item caps to limit the ability of publishers using Google's ad server to implement Header Bidding (see Section VII.C). Line item caps were an unnecessary restraint on publisher choice of exchanges for individual transactions.

- **Tying**: Google's decision to contractually tie AdX and DFP was intended to curb the threat posed by Header Bidding to Google's ad server monopoly. Google feared Header Bidding could evolve as an alternative inventory manager and remove DFP's control over publisher inventory (see Section VI.B.6).

- **UPR:** Google aimed to make rival exchanges, including those participating in Header Bidding, less likely to transact impressions by subjecting them to the same high floors as AdX (see Section VII.A).

- **Data Redactions:** Google removed critical information from databases provided to publishers through DFP, rendering it harder to evaluate the performance of exchanges participating in Header Bidding (see Section VII.D).

863. In addition to the conduct that I have found to be anticompetitive in itself, there were additional actions aimed at limiting the impact of Header Bidding that reinforce my economic conclusion that the conduct I have analyzed in detail in this report constituted a pattern of anticompetitive behavior on the part of Google.

1) Project Poirot

864. As one example, Google increased barriers to entry through Projects Poirot and Elmo. In 2017,[1091] gTrade started Project Poirot to identify when rival exchanges were not running an actual second-price auction.[1092] The algorithm relied on inputs from DBM's own bid data to detect and quantify any deviations from second-price auctions.[1093] Project Poirot adjusted the bids of DV360 in order to avoid overpaying for an impression and disguise its willingness to pay to third-party exchanges.[1094] Project Poirot was successful at decreasing the revenue of rival exchanges that were running non-second price auctions by [redacted] by sacrificing about [redacted] of DBM revenue.[1095] Launch impact analysis from internal documents shows an increase of [redacted] in spending in AdX while decreasing spending by [redacted] for Pubmatic, [redacted] for OpenX and [redacted] for Rubicon, which are some of the largest rival exchanges to AdX. [1096] One Google employee states that Poirot has made quite an effective effort in responding to Header Bidding.[1097]

865. Poirot resulted in reallocating revenue from rival exchanges to Google's own exchange, which had no benefit to advertisers or publishers. They are examples of the actions that Google could take to alter the flow of information into markets in ways that were not motivated by the needs of Google consumers (publishers/advertisers) but could disrupt the efficient operation of markets in ways that potentially reduced match quality and, potentially, and made it more difficult for rival exchanges and entrants to compete.

2) Facebook agreement

866. In September 2018, Google and Facebook signed an agreement to allow Facebook Audience Network (FAN) to take part in Google's recently launched Exchange Bidding service. Google viewed this deal as an important part of increasing the attractiveness of Exchange Bidding, particularly in competition

[1091] Google's First Am. Resps. and Objs. to Plaintiff's Third Set of Interrogs. (May 24, 2024) at 12.
[1092] GOOG-NE-05279363 at -374. "Bidding in adversarial auctions" (October 4, 2018). Internal Google presentation by Gtrade on projects Poirot and Elmo.
[1093] GOOG-NE-05279363 at -374. "Bidding in adversarial auctions" (October 4, 2018). Internal Google presentation by Gtrade on projects Poirot and Elmo. ("...Algorithmic framework to detect and quantify deviations from second price auctions using DBM data")
[1094] GOOG-NE-05279363 at -375. "Bidding in adversarial auctions" (October 4, 2018). Internal Google presentation by Gtrade on projects Poirot and Elmo.
[1095] GOOG-NE-11275306 at -306. "Project Poirot" (January 18, 2019). Internal Google design document for project Poirot. ("Non-second price exchanges will see a revenue drop in the range o[redacted] Overall DBM revenue impact is [redacted]")
[1096] GOOG-NE-05279363 at -382. "Bidding in adversarial auctions" (October 4, 2018). Internal Google presentation by Gtrade on projects Poirot and Elmo. (Slide summarizing launch impact)
[1097] GOOG-DOJ-05276794 at -794. "Re: Header Bidding Observatory / Edition #3" (March 16, 2018). Internal email thread between [redacted]. ("Poirot has actually been quite effective, resulting in DBM spending [redacted] more on AdX and reducing spend on most other exchanges.")

with Header Bidding. As stated by [redacted], moving Facebook web inventory off Header Bidding and onto Exchange Bidding would "further weaken the header bidding narrative in the marketplace."[1098]

867. Facebook viewed this deal as an important route to access publisher inventory it would otherwise not be able to access (such as AdMob inventory) or could only access under unfavorable terms through Header Bidding (such as being subject to Last Look). Additionally, [redacted].[1099] Having Meta partner with Exchange Bidding would help with that plan significantly.

868. Initially, in March 2017, Facebook announced its support for Header Bidding and began allowing mobile web publishers who used Header Bidding to join Audience Network through Header Bidding.[1100]

869. At the same time, a top priority for Google for the year was to fight off the existential threat posed by Header Bidding and the Facebook Audience Network.[1101] According to Google, "if header bidding consolidates all non-Google demand, we could lose our must-call status and be dis-intermediated."[1102] Google's mandate was to "forestall major industry investment in HB and HB wrapper infrastructure."[1103]

[1098] GOOG-NE-07564675 at -675. "Fwd: Facebook on Exchange Bidding/Open Bidding Deal Review in ACM and BC" (September 13, 2018). Internal Google email discussing the Facebook Network Bidding Agreement deal.

[1099] [redacted] deposition of [redacted]. Google EBDA Meeting notes from February 15, 2017. (*See also,* 00007504); *See also,* GOOG-NE-09090203 at -210. "Facebook Partnership" (November 2017). Internal Google Top Partner Council Review presentation. ("Advertising Strategy. Protect Google's Assets. Protect DoubleClick's leadership position in 3P ad buying/selling.")

[1100] Meta Audience Network. "Header Bidding for Mobile Web - Facebook Audience Network" (March 22, 2017). Accessed on June 3, 2024. https://www.facebook.com/audiencenetwork/news-and-insights/header-bidding-through-partnerships. ("We believe that header bidding and the principles behind it are better for publishers, advertisers, and people, which is why starting today we are opening up Audience Network to qualified mobile web publishers who work with a select group of technology partners: Amazon Publisher Services, AppNexus, Index Exchange, Media.net, Sonobi and Sortable. Moving forward, mobile web publishers who use header bidding will be able to join Audience Network through approved partners or through open-source header bidding solutions like PreBid and PubFood.")

[1101] GOOG-NE-04421287 at -287. "Fwd: GSL Thoughts for Sell-Side Marketing Support" (December 9, 2016). Internal Google email from [redacted] discussing marketing resource allocation. ("2017 Sell-Side Priorities: AdX Value Prop update and Header Bidding and FAN response. Need to fight off the existential threat posed by Header Bidding and FAN. This is my personal #1 priority. If we do nothing else, this needs to an all hands on deck approach."); Note, Google also recognized other Header Bidding partners that could put AdX revenue at risk. *See*, GOOG-NE-03633989 at -996. "Sell side BFM Deck" (undated). Internal Google presentation notes and talking points. ("The rise of header bidding, when pubs call other competitive networks and exchanges, like AMZN, FB, or Rubicon, outside of the ad server is exacerbating this problem. This is an issue because [(1)] when HB is used, we are NO LONGER the 'decision engine' as RTB decision starts outside the ad server […] [(2)] our ability to ensure AdX has a fair look at the inventory in real-time. This is posing something of an existential risk on our sell-side business and there is a risk that DSPs, in addition to networks and exchanges, ALSO bid in header tags, putting much of our AdX revenue at risk.")

[1102] GOOG-TEX-00105361 at -364. "FAN Bidding in to DRX and AdMob" (April 28, 2017). Internal Google presentation.

[1103] GOOG-NE-12799046 at -053. "Exchange Bidding ("Jedi") Q3 Update" (October 5, 2016). Internal Google presentation. ("proposed "Jedi++ goal/mandate – need to confirm. Forestall major industry investment in HB & HB wrapper infrastructure.")

870. However, by 2018, [redacted][1104]

871. [redacted]. According to [redacted],[1105] [redacted]."[1106]

872. Further, [redacted]."[1107] For example, [redacted].

873. [redacted].[1108] [redacted]

[1104] Deposition of [redacted]

[1105] Deposition of [redacted]

[1106] Deposition of [redacted]

[1107] Deposition of [redacted]

[1108] Deposition of [redacted]

[redacted][1109] [redacted]. Additionally, [redacted].[1110] Ultimately, [redacted][1111]

874. Thus, Meta decided to partner with Google via Open Bidding. Meta signed the initial Network Bidding Agreement (NBA) on September 28, 2018.[1112] As part of the deal, [redacted][1113] and [redacted][1114] As part of the NBA, [redacted]

[redacted]

[1109] Deposition of [redacted]

[1110] Deposition of [redacted]

[1111] Deposition of [redacted]

[1112] Deposition of [redacted]

[1113] Deposition of [redacted]

[1114] Deposition of [redacted]

[redacted],[1116] a guaranteed match rate for Meta,[1117] and malware identification for Meta,[1118] which gave Meta advantages that were not available to other auction participants and resulted in an uneven playing field in subsequent auctions. Given the confidentiality of the NBA, these Meta advantages were not disclosed to other participants.[1119] Instead, Google stated in its Help Center website: "All participants in the unified auction, including Ad Exchange and third-party exchanges, compete equally for each impression on a net basis."[1120]

C. Google's conduct harms innovation

875. Collectively, all of Google's conduct has allowed Google to obtain supracompetitive profits by limiting the competitive alternatives it faced. Google monetizes its market power through its fees or "take rate" on AdX and Google Ads. It also charges a licensing fee for the use of its ad server, DFP. Google has the ability to vary its fee structure across markets but imposes the largest fee on AdX which applies to all AdX transactions. Google's conduct forces all advertisers that desire DFP inventory to utilize AdX, and all publishers that want to access Google Ads demand must use AdX. Moreover, much of Google's other conduct that I have described also causes an increased use of AdX. It makes sense that Google monetizes its monopoly power through its ad exchange.

[redacted]

[1115] Deposition of [redacted]

[1116] Deposition of [redacted]

[1117] [redacted]_000000680 at -712 to -713. [redacted]

[1118] [redacted]_00327634 at -634. [redacted]

[1119] [redacted] 000000680 at -704, -705. [redacted]

[1120] Google Ad Manager Help. "How Open Bidding works" (undated). Accessed on June 5, 2024. https://support.google.com/admanager/answer/7128958

Figure 39

[redacted]

876. As Google described: "AdX is the lifeblood of our programmatic business. Without AdX margins, our programmatic business doesn't seem like a worthwhile endeavor."[1121] As I demonstrated in Section V.D, AdX had market share above [redacted] than its next rival, and is tied to both its ad server with above [redacted] market share and to Google Ads.

877. We can observe the impact of Google's market power on its AdX take rate. Using available data, I have assembled the take rates for AdX and its competitive rivals.

Table 8

[redacted]

[1121] GOOG-NE-05271214 at -223. "Re: Rubicon margins" (November 4, 2017). Internal Google email responding to ad exchanges cutting fees.

[redacted]

878. Notice that Google's take rate remained high despite declining prices by Rubicon and [redacted] and lower prices by [redacted] and AppNexus (Xandr). [redacted][1128] Based

---

1122 [redacted]

1124 [redacted] take rate is produced using [redacted] 0001. [redacted]

1125 [redacted] take rate is produced using [redacted] 00000031. [redacted]

1126 [redacted] take rate is produced from [redacted] -00000001. [redacted]

1127 AppNexus's take rate comes from the following source: AdExchanger. "Rubicon Got Rid Of its Buy-Side Fees – But Who Else Is Charging Them?" (Novermber 8th, 2017). Accessed on June 4, 2024. https://www.adexchanger.com/platforms/rubicon-got-rid-buy-side-fees-else-charging/. ("The average SASC fee charged in Q3 2017 was [redacted]

1128 Deposition of [redacted]

on limited 2018 data, these rivals are comparatively smaller, but they are not insignificant.[1129] Unresponsive prices suggests that Google had monopoly power in the ad exchange market.

879. Numerous Google documents recognized that the AdX take rate was both high and unresponsive to the prices of its competitors.

880. A 2017 internal Google strategy document refers to AdX take rate as an "industry-high."[1130] Comments from [redacted] also indicate that Google was not seeing pressure on the AdX [redacted] take rate.[1131]

881. A 2018 Google strategy document warned that competitors like Index Exchange, Rubicon and AppNexus cut take rates due to the impact of Header Bidding.1132 For example, Google notes the impact of Header Bidding on Rubicon, stating the exchange "once posted take rates of [redacted] Now it plans to lower them to the [redacted] range."[1133]

882. In a 2018 email exchange, [redacted], Director of Product Management for Google's Publisher Ad Platform, recognized that if all other exchanges were at a [redacted] take rate, Google could justify the AdX take rate. However, "now that Index is at [redacted] and AppNexus is offering [redacted] at least as a promotion, the question is whether we [Google] can defend a [redacted] or [redacted] premium [redacted])."[1134]

[1129] See Section V.C.1; "Google's competitors have a minor market presence compared to AdX. AdX is almost [redacted] as large as the next closest rival, Xandr. In 2018, Google's exchange transacted at least [redacted] in gross revenue. Rival exchanges like Xandr transacted less than $2 billion, Rubicon and [redacted] each transacted less than $1 billion, [redacted] and [redacted] transacted close to [redacted] each. This difference reflects the fragmentation of the non-Google share of the market."

[1130] GOOG-DOJ-27774051, at -055. "2017 ACSO Strategy Sheet" (undated). Internal Google strategy document. ("Be more aggressive – lower AdX's industry-high [redacted] revshare and accelerate exchange bidding + programmatic deals, to attract more third-party demand into our platform.")

[1131] GOOG-NE-11809454 at -454. "SellSide Guiding… - Just how much pressure we are under?…" (August 6, 2018). Internal Google comments on SellSide Guiding Principles document.

[1132] GOOG-AT-MDL-003977297 at -318. "Buyside Deep Dive" (March 2018). Internal Google presentation. ("Exchanges and SSPs: margin compression as header bidding makes yield management ineffective, buyers are smarter. Rubicon slashed take rate in half over 2017. AppNexus reduced their take rate even further ([redacted]). Index Exchange [redacted] of their inventory comes from exchange bidding.")

[1133] GOOG-DOJ-AT -01811246 at -255. "Header Bidding Observatory #3" (Q1 2018). Internal Google presentation detailing status of Header Bidding adoption and trends.

[1134] GOOG-NE-09466491 at -491. "Re: Achir knows about Hearst" (January 30, 2017) Internal Google email from [redacted]. ("[redacted]")

883. A 2019 operational plan document indicated that Google's [redacted] fee was "[redacted]."[1135]

884. Google acknowledged that its high and stable take rate was the result of its monopoly power. Eisar Lipkovitz acknowledges that the [redacted] AdX take rate "isn't likely justified by value."[1136] Industry participants also recognized this. [redacted]"[1137]

885. A 2017 interview with the AppNexus CEO, Brian O'Kelly, emphasizes that AdX did not have to compete in exchange take rate, while AppNexus had to lower its fees to [redacted].1138 In response to O'Kelley's comments, [redacted]."[1139]

886. Commenting on the price pressure, Google stated: "this price pressure is probably likely a trend, where the exchanges that do not have some special asset (like data fueled walled garden) will have to

[1135] GOOG-AT-MDL-B-005113841 at 845. "Sell-Side 2019 Operational Plan" (undated). Internal planning document discussing initiatives focused on Ad Manager, AdSense, and shared services such as third-party buyers. ("AB [Authorized Buyer] rate adjustment. Our [redacted] sell-side margin is [redacted]. We would like to lower price to recapture spend, bundled with the other pricing changes mentioned above to ensure we have an overall positive impact on net margin.")
[1136] GOOG-NE-05271214 at -222. "Re: Rubicon margins" (November 4, 2017). Internal Google email responding to ad exchanges cutting fees.
[1137] Deposition of [redacted]
[1138] AdExchanger. "AppNexus CEO Brian O'Kelly On Waging A Price War" (November 9, 2017). Accessed on June 2, 2024. https://www.adexchanger.com/platforms/appnexus-ceo-brian-okelley-waging-price-war/. ("Less than a week after Rubicon Project slashed its take rate in half, to 10% to 12%, by doing away with buy-side fees, AppNexus said its fees are even lower. The company revealed it charges an 8.5% average to the sellers on its platform. […] If someone else says they are going to cut the rate card on a publisher below AppNexus', we should SPO [supply path optimize] to the lower rate card. It's going to be a price war. If Google wants to compete on rates, let's do it. So far, Google has not been interested in doing that. ")
[1139] [redacted]0115168 at -168. [redacted]

compete on features, price, and agnosticsm. We [Google] can beat them on features, we [Google] should not follow them on price."[1140]

887. Google's AdX take rate is structured like a tax. For example, if a demand-side platform or DSP pays AdX [redacted] for an impression, AdX keeps [redacted], and pays the publisher [redacted]. The burden of the tax depends on the elasticities of demand and supply. It is likely that both publishers and advertisers will bear some of the burden of the take rate. However, because in my judgment, publishers face quite limited options (elasticity of supply) for the sale of their open web display impressions, they likely pay a greater share of the AdX take rate.

888. As a result of being forced to pay a higher take rate, publishers' ability to invest in content and innovation is reduced. This adversely affects publishers' content quantity and quality. It also makes publishers more reluctant to generate free content. Moreover, because publishers' profits are reduced, entry into publishing is impeded.

889. Lower publisher quality, entry, and innovation harms end user who receive less relevant information or are forced to buy subscriptions or navigate pay walls to obtain desired content.

890. Advertisers also bear some of the burden of noncompetitive take rates. According to Google, these higher costs are likely passed on to end users. [redacted] states that "competition in ads [...] has helped lower online advertising costs by [redacted] over the last 10 years, with these savings passed down to consumers through lower prices."[1141] If advertisers pass on the benefits of lower costs, they also likely pass on the higher costs to end users.

[1140] GOOG-NE-05271214 at -224. "Re: Rubicon margins" (November 4, 2017). Internal Google email responding to ad exchanges cutting fees.

[1141] "Written Testimony of [redacted], Chief Executive Officer, Alphabet Inc., Before the House Committee on the Judiciary, Subcommittee on Antitrust, Commercial, and Administrative Law Hearing on 'Online Platforms and Market Power, Part 6: Examining the Dominance of Amazon, Apple, Facebook, and Google," Congress.gov, July 29, 2020, available at https://www.congress.gov/116/meeting/house/110883/witnesses/HHRG-1 16-JU05-Wstate-PichaiS-20200729.pdf, last accessed December 19, 2023, at p. 3.

APPENDIX A

Joshua Samuel Gans

Contact
Phone (Canada): (647) 273 3202
Address: 122 Walmer Rd, Toronto ON M5R2X9
E-Mail: Joshua.Gans@gmail.com

Citizenship: Australian, Canadian

Education

Stanford University, U.S.A., Doctor of Philosophy (in Economics), 1990 - 1994, Dissertation Title: *Essays on Economic Growth and Change*, Advisors: Professors Paul Milgrom, Kenneth J. Arrow and Avner Greif.
University of Queensland, Australia, B.Econ (First Class Honours) with majors in Economics and Law, 1986 - 1989.

Positions Held

Current:
Professor of Strategic Management and Jeffrey S. Skoll Chair of Technical Innovation and Entrepreneurship, Rotman School of Management, and (Honorary) Professor, Dept of Economics, University of Toronto (July 2011 -)
Chief Economist, Creative Destruction Lab, University of Toronto (June 2014 -)
Area Coordinator, Department of Strategic Management, Rotman School of Management (July 2013 – June 2019, July 2024 -)
Research Associate, National Bureau for Economic Research (May 2012 -)
Research Affiliate, Center for Digital Business, Sloan School of Management, Massachusetts Institute of Technology (May 2012 -)
Managing Director, Core Economic Research (June 2001 -)
Associate Editor, Journal of Industrial Economics (2008 -)
Founder, President and Chief Operating Office, All Day TA Inc (April 2024 -)

Previous:
Professor of Management (Information Economics), Melbourne Business School University of Melbourne (October 2000 – June 2011); Professorial Fellow, Department of Economics, University of Melbourne (2001-2011), Associate Professor (July, 1996 – October 2000)
Visiting Researcher, Microsoft Research (New England Lab) (January – June 2011).
Visiting Scholar, Harvard University (Economics) and NBER (December 2009 – January 2011).
Department Editor, Management Science (Strategy) (2017 - 2023); Associate Editor (2010 – 2017)
Co-Editor, International Journal of Industrial Organization (2005 - 2011)
Co-Editor, Journal of Economics and Management Strategy (2003 - 2008)
Director, Centre for Ideas and the Economy, Melbourne Business School (October 2006 – August 2011).
Director, Economic Theory Centre, University of Melbourne (January, 2006 – December 2009); Associate Director (September 2001 – December 2005).
Director, Intellectual Property Research Institute of Australia (August 2006 – January, 2007), Associate Director (March, 2002 - August 2006).
Chief Economist, Revlo (2015 - 2017)
Advisory Board, The Conversation (2011 - 2020)
Advisory Board, Streambed (2020 - 2022)

Advisory Board, Coursepeer Ltd (2012 - 2019)
Advisory Board, Atlus Inc (2012 - 2013)
Advisory Board, PenyoPal Inc (2012 - 2014)
Advisory Board, Rismark Pty Ltd (2005 - 2012)
Advisory Board, Aplia.com (2005 - 2007)
Director, Melbourne Business School Ltd (October 2003 – October 2006)
Vice President (Economics), CDL Rapid Screening Consortium (August 2020 -September 2022)
Lecturer, School of Economics, University of New South Wales (September, 1994 - July, 1996)

Honors and Awards

Balsillie Prize for Public Policy, Finalist, 2023
Research Fellow, FinTech@Cornell Initiative
Distinguished Academic Fellow, Melbourne Business School, 2022
Senior Academic Fellow, e61 Institute, 2021 -
Academy of Management, Innovation in Entrepreneurship Pedagogy Award, 2021
Fellow, Luohan Academy, 2020 -
Distinguished Scholar Award (Rotman), 2020
PURC Distinguished Service Award, 2019
Finalist for HBR McKinsey Award, 2018
Roger Martin Award for Research Excellence, 2016-17
Winner of PROSE Award for best book in Business, Management, Finance, 2017
Best Paper in Technology Management, Informs (Runner-Up), 2013
Excellence in Teaching Award, Rotman School of Management, 2012
Excellence in Refereeing Award, *American Economic Review*, 2012
Fellow, Strategy Research Initiative, 2012 - 2018
Australian Publishers Association Award for Best Tertiary Adaptation (Teaching & Learning), 2009.
Fellow of the Academy of Social Sciences, Australia, 2008 -
Young Economist Award, Economic Society of Australia, 2007
Woodward Medal in Humanities and Social Science, 2006
Professorial Fellow, Department of Economics, University of Melbourne, 2001 - 2011
Best Discussant, Annual PhD Conference in Economics and Business, 2002.
Fellowship, Jerusalem Summer School in Economic Theory, 1993
Stanford Center for Conflict and Negotiation Fellowship, 1993
Fulbright Postgraduate Scholarship, 1990
Stanford University Graduate Fellowship, 1990
University Medal, University of Queensland, Australia, 1989
Reserve Bank of Australia Cadet Scholarship, Australia, 1988

Teaching Experience

Postgraduate subjects in microeconomics, incentives and contracts, economics of innovation, macroeconomics, advanced game theory, personnel economics, entrepreneurship, network and digital market strategy (Rotman School of Management, University of Toronto, Melbourne Business School and University of New South Wales, AGSM and School of Economics)
The Next 36 (Toronto), lectures in digital market strategy and entrepreneurial strategy

Undergraduate subjects in microeconomics, macroeconomics, technological change and development, network and digital market strategy (University of Toronto, University of New South Wales)
Executive Education in technology strategy (INSEAD) and regulatory economics

Consulting

Long-term Associations

- Charles River Associates, Senior Consultant (August 2002 – August 2005, May 2022 –)
- Brattle Group (January 2015 – April 2022)
- Keystone Strategy (August 2011 – December 2014)
- CoRE Research (June, 2001 – September 2014)
- Australian Competition and Consumer Commission (October, 1999 – June 2000; March 2006 – December 2007)
- The Economist Advocate (February, 1999 – June 2002)
- London Economics, Australia (February 1997 - May, 1999)

Litigation and Witness Statement Preparation

- Expert witness statement on behalf of a class of advertisers against Meta for anti-trust violations (June 2023 – April 2024)
- Expert witness on behalf of ICON on harm from unauthorized minting and distribution of crypto-tokens (February, 2024)
- Expert witness for the USDOJ on the potential merger between Adobe and Figma (October 2023 – December 2023)
- Expert witness on behalf of AT&T on damages associated with cryptocurrency theft, Terpin vs. AT&T (January, 2022 – May 2023)
- Expert witness on behalf of Xiaomi in a FRAND royalty dispute with Philips (Spain, Germany, India, Netherlands) (April 2021 – May 2022)
- Expert witness on behalf of AT&T in an arbitration on damages associated with cryptocurrencies (April – June, 2021).
- Expert witness on behalf of ComicMix in fair use copyright matter, Dr Seuss vs ComicMix (16-CV-2779 JLS) (2018 – 2019)
- Expert witness statement on cryptocurrency trading for an arbitration (May – August, 2018)
- Expert witness statement on behalf of a class in a matter against General Motors in ignition switch damages (March 2018 -)
- Expert witness testimony on behalf of R2 Semiconductors against Intel, Dell and Hewlett Packard for a patent infringement exclusion order in the US International Trade Commission (February 2017 – July 2017).
- Expert witness testimony on behalf of the National Music Publishers Association in a Copyright Board determination of mechanical royalties for song-writers (June 2016 – March 2017); including deposition.
- Expert witness in valuation of intellectual property matter on behalf of Semantic Computing (June – November 2015)
- Expert witness on copyright dispute for arbitration with regard to mobile apps for telecommunications carriers (2013-14).
- Expert witness in class action against Whirlpool Ltd in Ohio on damages associated with damaged front-loading washing machines (2013 - 2014). Testified on damages in jury trial in October 2014; including deposition.
- Chief economic expert witness to the Federal Trade Commission on its antitrust claim – exclusionary conduct and abuse of market power – against Intel (2009-2010).

- Expert witness advice to Fortescue Metals Group in the Mt Newman declaration decision against BHP-Billiton, Australian Competition Tribunal (June 2007 – December 2009).
- Expert Witness Affidavit and Deposition on behalf of Third Wave Ltd in antitrust litigation in the HPV testing market against Digene Ltd in the US Federal Court, Wisconsin (August 2007 – January 2008); deposition only.
- Expert witness advice to the WA Potato Marketing Corporation in a constitutional dispute (July 2007 – January 2008)
- Expert witness advice to the ACCC on an Australian Copyright Tribunal dispute involving Fitness Australia and PPCA (May 2007 – April 2009)
- Expert witness statement construction on behalf of Foodstuffs NZ in Court proceedings with the NZCC on a potential acquisition of The Warehouse (August, 2007 – July 2008)
- Expert Witness Testimony on behalf of Victorian Chicken Meat Processors on the collective boycott authorisation for chicken growers at the Australian Competition Tribunal (July 2005 – November 2005).
- Expert Witness Testimony on behalf of ARA on hazardous waste trade in the Administrative Appeals Tribunal (December 2002 – February 2003).
- Expert testimony for TXU in appeal at the Victorian Supreme Court over the ORG's electricity pricing determination (March, 2001).
- Expert witness at Appeal Tribunal for United Energy appealing the Office of the Regulator General's Determination on prices for electricity distribution in Victoria (October, 2000)
- Expert witness at the Administrative Appeals Tribunal for the Australian Communications Authority on dispute with Cable and Wireless Optus over local number portability requirements (August, 1999)
- Advice to ACCC on trade practices matter against Safeway (July, 1998 – August,, 1999)
- Advice to ACCC on predatory pricing case against Boral (April, 1998 – February, 2000)
- Assistance to Professor Philip Williams in preparation of expert witness statement for Australian
- Competition Tribunal consideration of the authorisation of the Australian Performing Rights Association (January - August, 1998)
- Report on damages calculation for misleading information case in the building industry (August, 1997)
- Report on the economic theory of damages for price fixing violations (March, 1997)
- Submission of competitive implications of Pay TV mergers in New Zealand (Nov 1996)

Projects by Industry

1. Electricity

- Evaluation of a methodology for assessing market power in wholesale electricity markets in New Zealand for the Commerce Commission (June 2008).
- Economic advice to the ACCC on the proposed AGL-TRU Energy electricity asset swap in South Australian (March, 2007)
- Economic advice to the ACCC on the partial acquisition of Loy Yang Power by AGL (November – December 2003).
- Expert testimony for TXU in appeal at the Victorian Supreme Court over the ORG's electricity pricing determination (March, 2001).
- Report critiquing the form of regulation of Victorian electricity distribution, on behalf of United Energy (September - October, 2000).
- Participation in a training program for Macquarie Generation (December, 1999)
- Economic analysis of electricity generating asset in preparation for a bid (March, 1999)
- Analysis of a contract for sale of electricity to a smelter project (February, 1999)
- Report on NEMMCO pricing principles for the National Retailers Association (September, 1998)
- Analysis of gaming the National Electricity Market Rules (February, 1998)

- Analysis of proposal for allocation of power purchasing agreements in Queensland (December, 1997)
- Analysis of vesting contract arrangements for the Queensland Electricity Reform Unit (December, 1997)
- Analysis of proposals for electricity transmission pricing in Queensland (September, 1997)
- Report on options for electricity industry reform in Western Australia (September, 1997)
- The role of greenhouse gas regulation on electricity pool behaviour (July, 1997)
- Advisor to Queensland Electricity Reform Unit: review of generator market strategies in the NEM and the implications of contracts (May 1997 - November, 1999).
- Bid for Loy Yang: report on the implications of market power for asset values (October-February 1997);
- ETSA Generation: report on the regulation of market power (August, 1996);
- NSW Electricity: report to ACCC on potential for anticompetitive behaviour (March - April, 1996);

2. **Gas**

- Analysis of a proposed AGL-Alinta arrangement on behalf of the ACCC (May, 2006).
- Submission on behalf of Envestra to the Queensland Competition Authority regarding its determination on regulated prices for Queensland's gas distribution network (March - April, 2001).
- Analysis of the competitive implications of a gas contract for electricity generation (March, 1998).
- Advice on the use of electricity prices in gas supply contracts to generators (May, 1997).
- Evaluation of R.J. Rudden report on AGL's cross subsidies (April, 1997)
- Gas transmission pricing: reviewed IPART gas transmission submission on behalf of BHP (October 1996-April 1997);
- Gas market: report on the market power implications of the proposed Victorian gas market and examined alternative market arrangements (January-March 1997);
- ETSA Gas: reports on appropriate pricing of gas in electricity use (April, 1996);

3. **Telecommunications**

- Economic advice to the ACCC of mobile termination pricing (September 2007)
- Economic advice to the NZCC on imputation tests in telecommunications (April 2007)
- Economic advice to the ACCC on the copper tails pricing by the G9 (August, 2007)
- Economic advice to the ACCC on Telstra's ULLS undertakings (May – August 2006)
- Economic advice to the NZCC on a 0867 dispute with Telecom NZ (2006).
- Submission to the ACCC on behalf of AAPT in relation to the report by Professor Hausman on mobile termination (April 2005).
- Submission to the ACCC on behalf of Hutchison Telecommunications in respect of its mobile services review (July 2003).
- Submissions to the ACCC on behalf of AAPT in respect of Telstra's proposed PSTN undertakings (June 2003).
- Advice to Hutchison telecommunications on bundling in Pay TV markets (June 2002)
- Advice and analysis to AAPT with regard to its interconnection pricing dispute with Telstra at the Australian Competition Tribunal (April, 2001 – May, 2002).
- Report submitted as part of SingTel submission to the ACCC evaluating the competitive implications of Vodafone's undertakings with respect to its proposed bid for C&W Optus (February, 2001).
- Research report for ACCC on Mobile termination of fixed line calls (December, 1999)
- Research report for ACCC on PSTN termination by non-dominant networks (December, 1999)
- Expert witness for the Australian Communications Authority/ACCC in a matter against Cable and Wireless Optus at the Administrative Appeals Tribunal on local number portability (August, 1999)
- Advice to ACCC on commercial churn matter against Telstra (March, 1999 – January, 2000)
- Analysis of criteria for declaration of intercity transmission lines in telecommunications (ACCC); (March, 1998)

- Report on contracting arrangements in telecommunications (October, 1997)
- Report on local number portability and technology adoption for Telstra (November, 1996)

4. **Banking and Financial Services**

- Economic research on behalf of Visa International (March – October 2016).
- Submissions to the Senate and House of Representatives on issues associated with the stability of home mortgage markets including mortgage-backed securities (2006 – 2008).
- Economic advice to Suncorp on proposed acquisition of Promina (October – November 2006).
- Submission to the ACCC on behalf of Cash Services Australia regarding the share acquisition by National Australia Bank (October 2005).
- Submission to the ACCC on behalf of First Data with regard to its acquisition of CashCard (November 2003 – January 2004).
- Research report and assistance to the National Australia Bank in assessing the competitive implications and regulatory options for the setting of interchange fees in credit card associations (March, 2000 – March 2001).
- Examination of theoretical arguments regarding horizontal mergers in Australian banking industry (March, 1997 and May, 1998)
- Analysis, on behalf of Lend Lease, of submission to the ACCC for a joint venture between Lend Lease and National Mutual (November - December, 1997)
- Report on access to the electronic payments system for the National Australia Bank (March - July, 1998).

5. **Pharmaceuticals**

- Advice to Mayne Healthcare on wholesale reform under the Pharmaceutical Benefits Scheme (February 2002).
- Advice to the National Pharmaceutical Services Association on the changes to the wholesale margin in the Pharmaceutical Benefits Scheme (May 2001 - June 2001).
- Advice to Faulding Healthcare on implications of COAG review of the pharmaceutical industry (April, 1999 – June, 1999)
- Economic analysis, on behalf of Faulding, of the competition issues surrounding a proposed takeover of AMCAL by Faulding Retail (September, 1998).
- Report on merger authorisation for Sigma and QDL(Nov, 1996)

6. **Other**

- Report on behalf of Amazon UK regarding final offer arbitration (2022)
- Economics report on behalf of Yelp regarding Google Search (2019)
- Economic advice to the ACCC as part of its Digital Markets Competition Inquiry (2018-2019)
- Economic advice to Microsoft on antitrust matters (January – December, 2012)
- Economic advice to Microsoft on patent royalties (May, 2012 - 2015)
- Economic advice to US Airways on online travel retailing (February – May 2012)
- Economic advice to Foodstuffs (NZ) on a potential merger with The Warehouse (July-August, 2007).
- Economic advice to the NZCC on a dispute between Pete's Post and NZ Post on a s36 matter (March, 2007).
- Economic advice to Visy on price fixing matters and damages calculations (October 2006 - 2008).
- Advice to Metcash on the potential acquisition by Woolworths of an IGA Outlet in Jindabyne (June 2007 –August 2007)
- Economic advice to the ACCC on a proposed acquisition by Video Easy of Blockbuster (June – August, 2007)
- Economic advice to Leighton Holdings on a contract dispute with the WA Government (May – July 2007).

- Economic advice to the ACCC on exclusionary conduct by Nestle (October, 2006 – January 2007)
- Economic advice to OneSteel on proposed acquisition of Smorgon Steel (June – June 2007).
- Economic advice to ACCC on definitions of regulatory risk (June, 2006).
- Economic advice to VicForests on proposed auction designs (2006)
- Economic advice to Barloworld on their proposed acquisition of Wattyl (October 2004 – June 2006)
- Economic advice to the ACCC on Alinta's proposed acquisition of AGL (May 2006)
- Submission on behalf of CSR on exclusive dealing arrangements of James Hardie (February 2006)
- Economic advice to the ACCC on Toll's proposed acquisition of Patrick (October 2005 – March 2006)
- Economic advice to the ACCC on Patrick's proposed acquisition of FCL (July – September, 2005).
- Submission to the IPART review of rents for Crown Land for Broadcast towers on behalf of Broadcast Australia (May 2005).
- Economic advice to Pacific Brands on the proposed acquisition of Joyce by Dunlop Foams (September 2004 – January 2005).
- Economic analysis of smash repairs and insurance for Consumer Affairs Victoria (September, 2004).
- Analysis of exclusive dealing claim by Peter Stevens Motorcycles against Kawasaki on behalf of Kawasaki (July – October 2004).
- Report for the MTAA on shopper docket schemes in petrol retailing (August 2004).
- Economic advice to Boral on its proposed acquisition of Adelaide Brighton and litigation against the ACCC (May 2004 – October 2004).
- Work for AWBI on the value of the single desk and its performance in wheat marketing (September 2003 – September 2004).
- Report for Medibank Private on the economic case for a private health insurance rebate (October 2002 – February, 2003).
- Member of the Prime Minister's Home Ownership Taskforce (2002-2003).
- Submission to Productivity Commission on behalf of Adsteam Marine Ltd on harbour towage regulation (May – June 2002).
- Submission to ACCC on behalf of Adsteam Marine Ltd on capital cost calculations in harbour towage pricing (April 2002).
- Evaluation of the single desk selling of dairy products on behalf of the Australian Dairy Corporation (September 2001).
- Advice to the ACCC on competition issues associated with B2B E-Commerce (August - September, 2001).
- Submission to the Victorian Treasury on the role of economic regulation and supply security in the proposed Essential Services Commission, on behalf of the Regulated Businesses Forum (October, 2000).
- Submission to the Competition Review of the Wheat Marketing Act on behalf of AWB Limited (March - August, 2000).
- Analysis of the Victorian Freight Rail access pricing regime for Freight Australia (July, 2000).
- Paper for Inquiry into Intellectual Property on behalf of APRA (November, 1999).
- Competitive Analysis of the proposed acquisition of Hymix by Pioneer (December, 1998)
- Analysis of access pricing principles for interstate rail (ACCC); (December, 1997)
- Assistance to Fairfax on submission to Productivity Commission on broadcast regulation (April, 1999);
- Report on supply security in electricity, gas and water (December, 1998)
- Analysis of merger between two oil refineries (August, 1998)
- Report on the Efficient Allocation of Digital Spectrum for John Fairfax Holdings Ltd (February, 1998)
- Report on product standards for electrical appliances in Victoria (March, 1997)
- Report on social implications of a merger for the provision of radiology services in Queensland (Jan 1997)
- Report on infrastructure access dispute in aluminium mining (November, 1996).
- Freight Rail Corp (NSW): Access dispute resolution with IPART (October 1996).
- Rationale for group negotiations for regional medical practitioners (September, 1996).

- Air NZ: theoretical work on the efficiency of access pricing by airports (March - April, 1996);
- Local Government Reform in Tasmania: developing a conceptual framework for the re-organisation of governmental responsibilities among local and state governments (February - May, 1996).
- New South Wales Taxation Authority: Demand conditions in swimming pool construction (December, 1994).

Publications

Books

1. *The Microeconomics of Artificial Intelligence*, MIT Press, forthcoming.
2. *Bayesian Entrepreneurship* (edited with Ajay Agrawal, Arnaldo Camuffo, Alfonso Gambardella, Erin Scott and Scott Stern), MIT Press, forthcoming.
3. *Entrepreneurship: Choice and Strategy* (with Erin Scott and Scott Stern), Norton, 2024.
4. *The Economics of Artificial Intelligence: Health Care Issues* (edited with Ajay Agrawal, Avi Goldfarb and Catherine Tucker), University of Chicago Press, 2023.
5. *The Economics of Blockchain Consensus*, Palgrave, 2023.
6. *Power and Prediction: The Disruptive Economics of Artificial Intelligence (with Ajay Agrawal and Avi Goldfarb), Harvard Business Review Press,* 2022.
7. *The Pandemic Information Solution: Overcoming the Brutal Economics of Covid-19,* Endeavor Literary, 2021.
8. *The Pandemic Information Gap: The Brutal Economics of COVID-19*, MIT Press, 2020.
9. *Economics in the Age of COVID-19*, MIT Press, 2020.
10. *Innovation + Equality* (with Andrew Leigh) MIT Press, 2019.
11. *The Economics of Artificial Intelligence: A Research Agenda* (edited with Ajay Agrawal and Avi Goldfarb), University of Chicago Press, 2019.
12. *Prediction Machines: The Simple Economics of Artificial Intelligence* (with Ajay Agrawal and Avi Goldfarb), Harvard Business Review Press, 2018.
13. *Survive and Thrive* (edited with Sarah Kaplan), Dog Ear Publishing, 2017
14. *Scholarly Publishing and its Discontents*, Kindle Direct Publishing, 2017.
15. *The Disruption Dilemma* (MIT Press), 2016.
16. *Information Wants to be Shared*, (Harvard Business Review Press: Boston), 2012.
17. *Parentonomics: An economist dad's parenting experiences*, New South: Sydney, 2008 (MIT Press: Cambridge (MA), 2009).
18. *Core Economics for Managers*, Thomson Learning, 2005.
19. *Finishing the Job: Real World Policy Solutions in Housing, Health, Education and Transport*, (with Stephen King) Melbourne University Publishing: Melbourne, 2004.
20. *Publishing Economics: Analyses of the Academic Labour Market in Economics*, Edward Elgar: Cheltnam, 2000.
21. *Principles of Economics* (with Stephen King, Robin Stonecash and N. Gregory Mankiw), 6th Pacific Rim Edition, Cengage, Melbourne, 2015 (1st Australasian Edition, Harcourt, Sydney, 2000).
22. *Principles of Macroeconomics* (with Robin Stonecash, Stephen King and N. Gregory Mankiw), 6th Pacific Rim Edition, Cengage, Melbourne, 2015 (1st Edition, Harcourt-Brace, Sydney, 1999).
23. *Principles of Microeconomics* (with Stephen King and N. Gregory Mankiw), 6th Pacific Rim Edition, Cengage, Melbourne, 2015 (1st Edition, Harcourt-Brace, Sydney, 1999).

Working Papers

1. "A Comparison of Ex Ante and Ex Post Vertical Market Supply: Evidence from the Electricity Supply Industry" (with Frank Wolak)
2. "Market Structure in Bitcoin Mining" (with June Ma and Rabee Tourky)
3. "Initial Coin Offerings and the Value of Crypto Tokens" (with Christian Catalini).

4. "Self-Regulating Artificial General Intelligence"
5. "A Theory of Visionary Disruption"
6. "Three Things about Mobile App Commissions"
7. "Market Power in Artificial Intelligence"
8. "Copyright Policy Options for Generative Artificial Intelligence"
9. "Return to the Econ"
10. "Can Socially-Minded Governance Control the AGI Beast?"
11. "A Solomonic Approach to Ownership Disputes: An Application to Blockchain Front-running" (with Richard Holden)

Journal Articles

International

1. "Internal Disagreement and Disruptive Technologies," *Strategy Science*, 2024 (forthcoming).
2. "Interplay between Amazon store and logistics," (with Patrick Andreoli-Versbach), *European Competition Journal*, 2024.
3. "Prediction machines, insurance, and protection: An alternative perspective on AI's role in production," (with Ajay Agrawal and Avi Goldfarb), *Journal of the Japanese and International Economies*, 2024 (forthcoming).
4. "The Turing Transformation: Artificial intelligence, intelligence augmentation, and skill premiums," (with Ajay Agrawal and Avi Goldfarb), *Harvard Data Science Review*, 2024.
5. "Zero Cost'' Majority Attacks on Permissionless Blockchains (with Hanna Halaburda), *Management Science* forthcoming.
6. "Examining the relationship between workplace industry and COVID-19 infection: a cross-sectional study of Canada's largest rapid antigen screening program," (with Evgenia Gatov, Sonia Sennik, Avi Goldfarb, Janice Stein, Ajay Agrawal and Laura Rosella), *Journal of Occupational and Environmental Medicine* 66(2):p e68-e76, February 2024.
7. "Do we want less automation?" (with Ajay Agrawal and Avi Goldfarb), *Science*, Vol. 381, 2023, pp.155-158.
8. "Economic analysis of proposed regulations of cloud services in Europe," (with Mikael Herve and Muath Masri), *European Competition Journal*, Vol.18, No.3, 2023, pp.522-568.
9. "Cryptic Regulation of Crypto-Tokens," *Entrepreneurship and Innovation Policy and the Economy*, forthcoming.
10. "Artificial Intelligence Adoption and System-Wide Change," (with Ajay Agrawal and Avi Goldfarb), *Journal of Economics and Management Strategy*, 33 (2), 2024, pp.327-337.
11. "Artificial Intelligence Adoption in a Competitive Market," *Economica*, Vol.90, No.358, 2023, pp.69-705.
12. "Artificial Intelligence Adoption in a Monopoly Market," *Managerial and Decision Economics*, Vol.44, No.2, 2023, pp.1098-1106.
13. "A Solomonic Solution to Blockchain Front-Running," (with Richard Holden), *AEA Papers and Proceedings*, Vol. 113, 2023, pp. 248-252.
14. "Vaccine Hesitancy, Passports and the Demand for Vaccination," *International Economic Review*, Vol.64, No.2, 2023, pp.641-652.
15. "Optimal Allocation of Vaccines" *Oxford Review of Economic Policy* 38 (4), 2022, pp.912-923.
16. "Experimental Choice and Disruptive Technologies," *Management Science*, Vol. 69, No. 11, 2023, pp.7044-7058.
17. "Markets for Scientific Attribution," (with Fiona Murray), *Journal of Law, Economics and Organization*, *39*(3), 2023, 828-846.
18. "Entrepreneurial strategy: a choice-based approach to entrepreneurship education." (with Erin L. Scott, and Scott Stern), *Annals of Entrepreneurship Education and Pedagogy–2023* (2022): 393
19. "From Prediction to Transformation," (with Ajay Agrawal and Avi Goldfarb), *Harvard Business Review*, Nov-Dec 2022.

20. “I’m not sure what to think about them: Confronting naive present bias in a dynamic threshold public goods game.” (with Peter Landry) *Journal of Economic Behavior & Organization*, 197, 2022, 195-204.
21. “Tests for Infection versus Infectiousness of SARS-CoV-2,” *Managerial and Decision Economics* 43 (6), 2022, pp.1880-1887.
22. “The Economic Consequences of R = 1: Towards a Workable Behavioural Epidemiological Model of Pandemics,” *Review of Economic Analysis*, Vol.14, No.1, 2022, pp.3-25.
23. “The Microeconomics of Cryptocurrency,” (with Hanna Halaburda, Guillaume Haeringer and Neil Gandal*), Journal of Economic Literature*, 60(3), 2022, 971-1013.
24. “Storm Crowds: Evidence from Zooniverse on Crowd Contribution Design” (with Sandra Barbosu), Research Policy, Vol.51, No.1, 2022, pp.104414.
25. “The Economic Consequences of R = 1: Towards a Workable Behavioural Epidemiological Model of Pandemics,” *Review of Economic Analysis*, Vol.14, No.1, 2022, pp.3-25.
26. “The Specialness of Zero,” *Journal of Law and Economics* Vol.65, No.1, February 2022, pp.157-176.
27. “Large Scale Implementation of Rapid Antigen Testing for Covid-19 in Workplaces,” (with Avi Goldfarb, Ajay Agrawal, Sonia Sennik, Janice Stein and Laura Rosella), *Science Advances*, Vol.8, No.8, 2022: eabm3608.
28. “False-Positive Results in Rapid Antigen Tests for SARS-CoV-2” (with Avi Goldfarb, Ajay Agrawal, Sonia Sennik, Janice Stein and Laura Rosella), *JAMA*. Published online January 07, 2022. doi:10.1001/jama.2021.24355. “False-Positive Results in Rapid Antigen Tests for SARS-CoV-2” (with Avi Goldfarb, Ajay Agrawal, Sonia Sennik, Janice Stein and Laura Rosella), *JAMA.* Published online January 07, 2022. doi:10.1001/jama.2021.24355.
29. “How AI will change strategy: A thought experiment,” (with Ajay Agrawal and Avi Goldfarb), *Harvard Business Review*, Winter 2021, pp.30-31.
30. “Enabling Entrepreneurial Choice,” *Management Science* (with Ajay Agrawal and Scott Stern), Vol.67, No.9, 2021, pp.5510-5524.
31. “Choosing Technology: An Entrepreneurial Strategy Approach,” (with Michael Kearney, Erin Scott and Scott Stern), *Strategy Science*, Vol.6, No.1, 2021, pp.39-53.
32. “Exit, Tweets and Loyalty,” (with Avi Goldfarb and Mara Lederman), *American Economic Journal: Microeconomics*, Vol.13, No.2, 2021, pp.68-112.
33. The Allocation of Decision Authority to Human and Artificial Intelligence,” (with Susan Athey and Kevin Bryan), *AEA Papers and Proceedings*, vol.110, 2020, pp. 80-84.
34. “To Disrupt or not to Disrupt,” *Sloan Management Review*, 2020,
35. “Some Simple Economics of the Blockchain” (with Christian Catallini) *Communications of the ACM*, ol. 63 No. 7, July 2020, pp.80-90
36. “Self-Recognition in Teams” (with Peter Landry), *International Journal of Game Theory* (forthcoming).
37. “Inequality and Market Concentration, When Shareholding is More Skewed than Consumption,” (with Andrew Leigh, Martin Schmalz and Adam Triggs), *Oxford Review of Economic Policy*, Volume 35, Issue 3, Autumn 2019, pp.550–563.
38. “Foundations of Entrepreneurial Strategy” (with Scott Stern and Jane Wu) *Strategic Management Journal* Vol.40, No.5, May 2019, pp.736-756.
39. “Artificial Intelligence: The Ambiguous Labor Market Impact of Automating Prediction,” (with Ajay Agrawal and Avi Goldfarb), *Journal of Economic Perspectives*, Volume 33, Number 2, Spring 2019, pp.31–50.
40. “Exploring the Impact of Artificial Intelligence: Prediction versus Judgment,” (with Ajay Agrawal and Avi Goldfarb), *Information Economics and Policy*, Volume 47, June 2019, Pages 1-6.
41. “Strengthening a Weak Rival for a Fight” (with Martin Byford), *International Journal of Industrial Organization* Volume 63, March 2019, pp.1-17.
42. “A Theory of Multihoming in Rideshare Competition,” (with Kevin Bryan), *Journal of Economics and Management Strategy* (forthcoming).
43. “Getting Prices Right on Digital Music Copyright,” *Review of Economic Research on Copyright Issues*,” Vol.15, No.2, 2018, pp.1-22.
44. “Control versus Execution: Endogenous Appropriability and Entrepreneurial Strategy,” (with Kenny Ching and Scott Stern), *Industrial and Corporate Change*, 2018, pp.1-20.

45. "Economic Policy for Artificial Intelligence," (with Ajay Agrawal and Avi Goldfarb), *Innovation Policy and the Economy*, 2018 (forthcoming).
46. "The Impact of Consumer Multi-Homing on Advertising Markets and Media Competition," (with Susan Athey and Emilio Calvano), *Management Science*, 64(4), April 2018, pp. 1574–1590.
47. "Strategy for Start-Ups" (with Erin Scott and Scott Stern), *Harvard Business Review*, May-June, 2018.
48. "Human Judgment and AI Pricing," (with Ajay Agrawal and Avi Goldfarb), *AEA: Papers and Proceedings*, 2018.
49. "Does Organizational Form Drive Competition? Evidence from Coffee Retailing" (with Brian Adams, Richard Hayes and Ryan Lampe) Economic Record (forthcoming)
50. "Contracting over the Disclosure of Scientific Knowledge" (with Fiona Murray and Scott Stern), *Research Policy* Volume 46, Issue 4, May 2017, pp.820-835.
51. "What to expect from Artificial Intelligence," (with Ajay Agrawal and Avi Goldfarb), *Sloan Management Review*, Feb 7, 2017.
52. "Endogenous Appropriability," (with Scott Stern), *American Economic Review Papers and Proceedings*, Vol.107, No.2, May 2017, pp.317-21.
53. "The Impact of Multi-homing on Advertising Markets and Media Competition" (with Susan Athey and Emilio Calvano), *Management Science* (forthcoming).
54. "Negotiating for the Market," *Advances in Strategic Management* J. Furman et.al. (eds), Volume 37, 2017, pp.3-36.
55. "Value Capture Theory: A Strategic Management Review," (with Michael Ryall), *Strategic Management Journal*, Vol.38, No.1, January 2017, pp.17-41.
56. "Weak versus Strong Net Neutrality: Correction and Clarification," (with Michael Katz) *Journal of Regulatory Economics*, Vol. 50, (1), 2016, pp. 99-110.
57. "The other disruption," *Harvard Business Review*, March 2016, pp.78-85.
58. "Keep Calm and Manage Disruption," *Sloan Management Review*, February 22, 2016.
59. "'Selling Out' and the Impact of Music Piracy on Artist Entry," *Information Economics and Policy* Vol. 32, September 2015, pp.58-64.
60. "Remix Rights and Negotiations over the use of Copy-Protected Works," *International Journal of Industrial Organization*, Vol.41, July, 2015, pp.76-83.
61. "Exploring Tradeoffs in the Organization of Scientific Work: Collaboration and Scientific Reward," (with Michael Bikard and Fiona Murray) *Management Science*, Vol.61, No.7, July 2015, pp.1473-1495.
62. "Weak versus Strong Net Neutrality," *Journal of Regulatory Economics*, Vol. 47 (2), 2015, pp.183-200.
63. "Does the Lunar Cycle Affect Births and Deaths?" (with Andrew Leigh), *Journal of Articles in Support of the Null Hypothesis*, Vol.11, No.2, February 2015.
64. "Collusion at the Extensive Margin" (with Martin Byford), *International Journal of Industrial Organization*, Vol. 37, November 2014, pp.75-83
65. "Dynamic Commercialization Strategies for Disruptive Technologies: Evidence from the Speech Recognition Industry," (with Matt Marx and David Hsu), *Management Science*, Vol.60, No.12, 2015, pp.3103-3123.
66. "Bilateral Bargaining with Externalities" (with Catherine de Fontenay), *Journal of Industrial Economics*, Vol.64, No.4, 2014, pp.756-788.
67. "Exit Deterrence" (with Martin Byford), *Journal of Economics and Management Strategy*, Vol.23, No.3, 2014, pp.650-669.
68. "Innovation Incentives Under Transferable Fast-Track Regulatory Review" (with David Ridley) *Journal of Industrial Economics*, Vol.61, No.3, 2013, pp.789-816.
69. "Entrepreneurial Commercialization Choices and the Interaction between IPR and Competition Policy," (with Lars Persson), *Industrial and Corporate Change*, Vol. 22, No. 1, 2013, 131-151.
70. "Innovation and Climate Change Policy," *American Economic Journal: Economic Policy*, Vol.4 No.4, 2012, pp.125-145.
71. "Mobile Application Pricing," *Information Economics and Policy*, Vol.24, No.1, March 2012, pp.52-59.

72. "Platform Siphoning: Ad-Avoidance and Media Content," (with Simon Anderson), *American Economic Journal: Microeconomics* Vol.3, No.4, November 2011, pp.1-34.
73. "How Does the Republic of Science Shape the Patent System? Broadening the Institutional Analysis of Policy Levers for Innovation and Knowledge Disclosure," (with Fiona Murray and Mackey Craven), *UC Irvine Law Review*, Vol.1 No.2, 2011, pp.359-395.
74. "Remedies for Tying in Computer Applications," *International Journal of Industrial Organization*, 29 (5), 2011, pp.505-512.
75. "Carbon Offset Provision with Guilt-Ridden Consumers" (with Vivienne Groves), *Journal of Economics and Management Strategy*, Vol.21, No.1, 2012, pp.243-269.
76. "Why Tie a Product Consumers Do Not Use" (with Dennis Carlton and Michael Waldman), *American Economic Journal: Microeconomics*, Vol.2, No.3, August 2010, pp.85-105.
77. "The Impact of Targeting on Advertising Markets and Media Competition," (with Susan Athey), *American Economic Review Papers and Proceedings*, Vol.100, No.2, May 2010, pp.608-613.
78. "When is Static Analysis a Proxy for Dynamic Considerations? Reconsidering Antitrust and Innovation," *Innovation Policy and the Economy*, Vol.11, 2010, MIT Press: Cambridge (MA).
79. "Exclusivity, Competition and the Irrelevance of Internal Investment," (with Catherine de Fontenay and Vivienne Groves), *International Journal of Industrial Organization*, Vol.28, No.4, 2010, pp.336-340.
80. "Is There a Market for Ideas?" (with Scott Stern), *Industrial and Corporate Change*, Vol.19, No.3, 2010, pp.805-837.
81. "The Millennium Bub" (with Andrew Leigh), *Applied Economics Letters*, Vol.16, No.14, 2009, pp.1467-1470.
82. "A Dearth of Exit Strategies," *Sloan Management Review*, Spring 2009, pp.19-20.
83. "Born on the First of July: An (Un)natural Experiment in Birth Timing," (with Andrew Leigh), *Journal of Public Economics*, Vol.93, Nos.1-2, February 2009, pp.246-263.
84. "A Bargaining Perspective on Strategic Outsourcing and Supply Competition," (with Catherine de Fontenay), *Strategic Management Journal*, Vol.29, No.8, August 2008, pp.819-839.
85. "The Impact of Uncertain Intellectual Property Rights on the Market for Ideas: Evidence for Patent Grant Delays" (with David Hsu and Scott Stern) *Management Science*, Vol.54, No.5, May 2008, pp.982-997.
86. "Concentration-Based Merger Tests and Vertical Market Structure" *Journal of Law and Economics* Vol.50, No.4, November 2007, pp.661-680.
87. "Introduction to Special Issue on 'Negotiations and Cooperative Arrangements in Industrial Organization,'" (with Roman Inderst) *International Journal of Industrial Organization*, Vol.25, No.5, October 2007, pp.879-883.
88. "Do Voluntary Carbon Offsets Work?" *The Economists' Voice*, Vol.4, Iss.4, 2007, Article 7.
89. "Minding the Shop: The Case of Obstetrics Conferences," (with Andrew Leigh and Elena Varganova), *Social Science and Medicine*, Vol.65, No.7, October 2007, pp.1458-1465.
90. "Price Discrimination with Costless Arbitrage," (with Stephen King), *International Journal of Industrial Organization*, Vol.25, 2007, pp.431-440.
91. "Vertical Contracting when Competition for Orders Precedes Procurement," *Journal of Industrial Economics*, Vol.55, No.2, June 2007, pp.325-346.
92. "Inefficient Ownership and Resale Opportunities," *Economics Letters*, Vol.93, 2006, pp.242-247.
93. "Patent Length and the Timing of Innovative Activity," (with Stephen King) *Journal of Industrial Economics*, Vol.55, No.4, December 2007, pp.772-772.
94. "Did the Death of Australian Inheritance Taxes Affect Deaths?" (with Andrew Leigh) *Topics in Economic Analysis and Policy*, Vol.6, No.1, 2006, Article 23.
95. "Toying with Death and Taxes: Some Lessons from Down Under," (with Andrew Leigh) *The Economists' Voice*, Vol.3, Issue 6, 2006.
96. "Paying for Loyalty: Product Bundling in Oligopoly," (with Stephen King) *Journal of Industrial Economics*, Vol.54, No.1, March 2006, pp.43-62.

97. "Vertical Integration in the Presence of Upstream Competition," (with Catherine de Fontenay) *RAND Journal of Economics*, 36 (3), 2005, pp.544-572.
98. "Markets for Ownership," *RAND Journal of Economics*, 36 (2), 2005, pp.433-455.
99. "Optional Fixed Fees in Multilateral Vertical Relations," (with Catherine de Fontenay) *Economics Letters*, Vol.88 (2), 2005, pp.184-189
100. "Patent Renewal Fees and Self-Funded Patent Offices," (with Stephen King and Ryan Lampe), *Topics in Theoretical Economics*, Vol.4, No.1, 2004, Article 6.
101. "Vertical Integration and Competition Between Networks," (with Catherine de Fontenay) *Review of Network Economics* Vol.4 (No.1), March 2005, pp.4-18.
102. "Can Vertical Integration by a Monopsonist Harm Consumer Welfare?" (with Catherine de Fontenay), *International Journal of Industrial Organization*, Vol. 22, No. 6, 2004, pp. 821-834.
103. "When Does Funding Research by Smaller Firms Bear Fruit? Evidence from the SBIR Program," (with Scott Stern), *Economics of Innovation and New Technology*, Vol.12, No.4, 2003, pp.361-384.
104. "A Technological and Organisational Explanation for the Size Distribution of Firms," (with John Quiggin) *Small Business Economics*, Vol.21, No.3, November 2003, pp. 243-256.
105. "Approaches to Regulating Interchange Fees in Payment Systems," (with Stephen King) *Review of Network Economics*, Vol.2, No.2, June 2003, pp.125-145.
106. "The Product Market and the Market for 'Ideas': Commercialization Strategies for Technology Entrepreneurs," (with Scott Stern), *Research Policy*, Vol.32, No.2, February, 2003, pp.333-350.
107. "Organizational Design and Technology Choice under Intrafirm Bargaining," (with Catherine de Fontenay), *American Economic Review*, Vol.93, No.1, March 2003, pp.448-455.
108. "The Neutrality of Interchange Fees in Payment Systems," (with Stephen King), *Topics in Economic Analysis and Policy*, Vol.3, No.1, 2003, Article 1.
109. "When Does Start-Up Innovation Spur the Gale of Creative Destruction?" (with David Hsu and Scott Stern), *RAND Journal of Economics*, Vol.33, No.4, 2002, pp.571-586.
110. "Exclusionary Contracts and Competition for Large Buyers," *International Journal of Industrial Organization*, Vol.20, 2002, pp.1363-1381.
111. "Regulating Private Infrastructure Investment: Optimal Pricing for Access to Essential Facilities," *Journal of Regulatory Economics*, Vol.20, No.2, 2001, pp.167-189.
112. "Numbers to the People: Regulation, Ownership and Local Number Portability," (with Stephen King and Graeme Woodbridge), *Information Economics and Policy*, 13 (2), June 2001, pp.167-180.
113. "Using 'Bill and Keep' Interconnect Arrangements to Soften Network Competition," (with Stephen King) *Economic Letters*, 71 (3), June 2001, pp.413-420.
114. "Regulating Endogenous Customer Switching Costs," (with Stephen King), *Contributions to Theoretical Economics*, Vol 1, Issue 1, 2001, Article 1.
115. "Mobile Network Competition, Customer Ignorance and Fixed-to-Mobile Call Prices," (with Stephen King), *Information Economics and Policy*, Vol.12, No.4, 2000, pp.301-328.
116. "Incumbency and R&D Incentives: Licensing the Gale of Creative Destruction," (with Scott Stern), *Journal of Economics and Management Strategy*, Vol.9, No.4, 2000, pp.485-511.
117. "Network Competition and Consumer Churn," *Information Economics and Policy*, Vol.12, No.2, 2000, pp.97-110.
118. "First Author Conditions," (with Maxim Engers, Simon Grant and Stephen King), *Journal of Political Economy*, Vol. 107, No.4, August 1999, pp.859-883.
119. "Limited Information, the Possibility of Rational Choice and the Contingent Valuation Method," *International Journal of Social Economics*, Vol.26, Nos.1/2/3, 1999, pp.402-414.
120. "Why Referees Don't Get Paid (Enough)," (with Maxim Engers), *American Economic Review*, Vol.88, No.5, December, 1998, pp.1341-1349.
121. "Industrialization with a Menu of Technologies: Appropriate Technologies and the "Big Push," *Structural Change and Economic Dynamics*, Vol.9, No.3, September 1998, pp.63-78.

122. "Time Lags and Indicative Planning in a Dynamic Model of Industrialisation," *Journal of the Japanese and International Economies*, Vol.12, 1998, pp.103-130.
123. "Fixed Cost Assumptions in Industrialization Theories," *Economic Letters*, Vol.56, 1997, pp.111-119.
124. "Measuring Product Diversity," (with Robert Hill), *Economic Letters*, Vol.55, No.1, 1997, pp.145-150.
125. "Urban Productivity and Factor Growth in the Late Nineteenth Century" (with Raphael Bostic and Scott Stern), *Journal of Urban Economics*, Vol.41, No.1 January 1997, pp.38-55.
126. "On the Impossibility of Rational Choice Under Incomplete Information," *Journal of Economic Behavior and Organization*, Vol.29, No.2, March 1996, pp.287-309.
127. "Majority Voting With Single-Crossing Preferences," (with Michael Smart) *Journal of Public Economics*, 58 (1), February 1996, pp.219-238.
128. "Best Replies and Adaptive Learning," *Mathematical Social Sciences*, Vol.30, No.3, 1995, pp.221-234.
129. "Evolutionary Selection of Beliefs," *Economic Letters*, Vol.49, No.1, July 1995, pp.13-17.
130. "How Are The Mighty Fallen: Rejected Classic Articles By Leading Economists," (with George Shepherd), *Journal of Economic Perspectives*, Vol.8, No.1, Winter 1994, pp.165-179.
131. "Time and Economics: Reflections on Hawking," *Methodus,* Vol.2, No.2, December 1990, pp. 80-81.
132. "Knowledge of Growth and the Growth of Knowledge," *Information Economics and Policy*, Vol.4, No.3, 1989-90, pp.201-224.

Local

1. "Beware Business Fads: Disruptive Innovation and Competition Policy," *Canadian Competition Law Review*, Vol.29, No.1, 2016, pp.28-40.
2. "Bargaining Over Labour: Do Patients have any Power?" (with Andrew Leigh), *Economic Record*, Vol.88, No.281, June 2012, pp.182-194.
3. "How Partisan is the Press: Multiple Measures of Media Slant" (with Andrew Leigh), *Economic Record*, Volume 88, Issue 280, pages 127–147, March 2012.
4. "'Big Bang' Telecommunications Reform," (with Stephen King), *Australian Economic Review*, Vol.43, No.2, 2010, pp.179-186.
5. "Using Markets in Innovation Policy," *Australian Economic Review*, Vol.42, No.1, 2008, pp.88-95.
6. "The delicate balance on parental leave," *Melbourne Review*, Vol.4, No.2, November 2008, pp.47-55.
7. "Where to next on credit card reforms?" (with Stephen King) *The Melbourne Review*, 4(1), May 2008, pp.42-48.
8. "The practicalities of emissions trading," (with John Quiggin) *The Melbourne Review*, 3(2), November 2007, pp.60-65.
9. "Looking Local on Broadband," *Public Policy*, Vol.2, No.1, 2007, pp.10-24.
10. "Unusual Days in Births and Deaths," (with Andrew Leigh), *The Melbourne Review*, 3(1), May 2007, pp.72-79.
11. "What is Different about Media Mergers," (with Simon Anderson), *Melbourne Review of Business and Public Policy*, Vol.2, No.2, November 2006, pp.32-36.
12. "Measuring innovative performance – essential for effective innovation policy and economic growth," (with Richard Hayes), *Melbourne Review of Business and Public Policy*, Vol.2, No.1, May 2006, pp.70-77.
13. "Reconsidering the Public Benefit Test in Merger Analysis: The Role of 'Pass Through'," *Australian Business Law Review*, 34 (1), 2006, pp.28-37.

14. "Dealing with difficult mergers," *Melbourne Review of Business and Public Policy*, Vol.1, No.1, November 2005, pp.78-82.
15. "'Protecting Consumers by Protecting Competition': Does Behavioural Economics Support this Contention?," *Competition and Consumer Law Journal,* 13 (1), 2006, pp.40-50.
16. "Competitive Neutrality in Access Pricing," (with Stephen King) *Australian Economic Review*, Vol.38, No.2, 2005, pp.128-136.
17. "Potential Anticompetitive Effects of Bundling," (with Stephen King) *Australian Business Law Review*, Vol.33, No.1, February, 2005, pp.29-35.
18. "Intellectual Property Rights: a Grant of Monopoly or an Aid to Competition," (with Philip Williams and David Briggs) *Australian Economic Review*, Vol.37, No.4, December 2004, pp.436-445.
19. "Taking into Account Extraordinary Circumstances in Regulatory Pricing," (with Stephen King), *Agenda*, Vol.11, No.4, 2004, pp.349-362.
20. "Supermarkets and Shopper Dockets: The Australian Experience," (with Stephen King) *Australian Economic Review*, Vol.37, No.3, pp.311-316.
21. "Does Australia's Health Insurance System Really Provide Insurance?" *Policy*, Vol.20, No.3, Spring 2004, pp.10-14.
22. "When are Regulated Access Prices Competitively Neutral? The Case of Telecommunications in Australia," (with Stephen King), *Australian Business Law Review*, Vol.32, No.6, pp.407-414.
23. "The Decision of the High Court in Rural Press: How the literature on credible threats may have materially facilitated a better decision," (with Rajat Sood and Philip Williams) *Australian Business Law Review*, 32 (5), October, 2004, pp.337-344.
24. "The Housing Lifeline: A Policy for Short-Run Housing Affordability," (with Stephen King) *Agenda*, Vol.11, No.2, 2004.
25. "Structural and Behavioural Market Power under the Trade Practices Act: An Application to Predatory Pricing," (with Anthony Niblett and Stephen King) *Australian Business Law Review*, Vol.32, No.2 April, 2004, pp.83-110.
26. "The Value of IP Protection in Markets for Ideas," *Australian Intellectual Property Law Bulletin*, Vol.16, No.6, 2003, pp.88-90.
27. "Contestability, Complementary Inputs and Contracting: The Case of Harbour Towage," (with Stephen King), *Australian Economic Review*, Vol.36, No.4, December 2003, pp.415-427.
28. "Access Holidays and the Timing of Infrastructure Investment," *Economic Record*, Vol.80, No.248, March 2004, pp.89-100.
29. "Anti-Insurance: Analysing the Health Insurance System in Australia," (with Stephen King), *Economic Record*, Vol.79, No.248, December 2003, pp.473-486.
30. "Access Holidays for Network Investment," (with Stephen King), *Agenda*, Vol.10, No.2, 2003, pp.163-178.
31. "A Theoretical Analysis of Credit Card Reform in Australia" (with Stephen King), *Economic Record* Vol.79, No.247, December 2003, pp.462-472.
32. "Regulating Termination Charges for Telecommunications Networks," (with Stephen King), *Australian Journal of Management*, Vol.27, No.1, June 2002, pp.75-86.
33. "The Economic Consequences of DVD Regional Restrictions," (with Emily Dunt and Stephen King), *Economic Papers*, Vol.21, No.1, 2002, pp.32-45.
34. "The Treatment of Natural Monopolies under the Australian Trade Practices Act: Three Recent Decisions," (with Frances Hanks and Philip Williams), *Australian Business Law Review*, Vol.29, No.6, December, 2001, pp.492-507.
35. "The Role of Interchange Fees in Credit Card Associations: Competitive Analysis and Regulatory Options," (with Stephen King), *Australian Business Law Review*, Vol.29., No.2, April 2001, pp.94-122.
36. "Benefits and Costs of Copyright: An Economic Perspective - Part 2," (with Megan Richardson, Frances Hanks and Philip Williams) *Australian Intellectual Property Law Bulletin*, Vol.13, No.6, 2000, pp.79-92.

37. "Benefits and Costs of Copyright: An Economic Perspective," (with Megan Richardson, Frances Hanks and Philip Williams) *Australian Intellectual Property Law Bulletin*, Vol.13, No.5, 2000, pp.62-65.
38. "Options for Electricity Transmission Regulation in Australia," (with Stephen King), *Australian Economic Review*, Vol.33, No. 2, June 2000, pp.145-161.
39. "The Competitive Balance Argument for Mergers," *Australian Economic Review*, Vol.33, No.1, March 2000, pp.83-93.
40. "The Role of Undertakings in Regulatory Decision-Making" (with Teresa Fels and Stephen King), *Australian Economic Review*, Vol.33, No.1, March 2000, pp.3-16.
41. "Economic Issues Associated with Access to Electronic Payments Systems," (with Richard Scheelings) *Australian Business Law Review*, Vol.27, No.5, December 1999, pp.373-390.
42. "Efficient Investment Pricing Rules and Access Regulation" (with Philip Williams), *Australian Business Law Review*, Vol.27, No.3, August 1999, pp.267-279.
43. "Growth in Australian Cities," (with Rebecca Bradley), *Economic Record*, Vol.74, No.226, September, 1998, pp.266-278.
44. "Contracts and Electricity Pool Prices," (with Danny Price and Kim Woods), *Australian Journal of Management*, Vol.23, No.1, June, 1998, pp.83-96.
45. "Driving the Hard Bargain for Australian R&D," *Prometheus*, Vol.16, No.1, March, 1998, pp.47-56.
46. "Access Regulation and the Timing of Infrastructure Investment," (with Philip Williams), *Economic Record*, Vol.75, No.228, March 1999, pp.39-49.
47. "Does Australia Really Need to Encourage its Innovators to Commercialise In-House?" *Policy*, Vol.13, No.4, March 1998, pp.36-40.
48. "Of Grand Prix and Circuses," *Australian Economic Review*, No.155, 3rd Quarter 1996, pp.299-307.
49. "Comparative Statics Made Simple: An Introduction to Recent Advances," *Australian Economic Papers*, June 1996, pp.81-93.
50. "Inside the Black Box: A Look at the Container," *Prometheus*, Vol.13, No.2, December 1995, pp.169-183.
51. "Chaos Theory, Nonlinearities and Economics: A Speculative Note," *Economic Papers*, Vol.10, No.1, March 1991, pp.40-53.

Book Chapters

1. "Price Collusion Using Artificial Intelligence," in *Antitrust Economics for Lawyers*, LexisNexis, 2023.
2. "Similarities and Differences in the Adoption of General Purpose Technologies," (with Ajay Agrawal and Avi Goldfarb), *Technology, Productivity, and Economic Growth*, (Susanto Basu, Lucy Eldridge, John Haltiwanger, and Erich Strassner eds.), NBER/University of Chicago Press, forthcoming.
3. "The Fine Print in Smart Contracts," in *Smart Contracts Technological, Business and Legal Perspectives,* Marcelo Corrales Compagnucci, Mark Fenwick & Stefan Wrbka (eds.), Hart Publishing: London, 2021, Chapter 2.
4. "Consensus Mechanisms for the Blockchain," (with Neil Gandal), in *The Palgrave Handbook of Technological Finance Edited by* Raghavendra Rau, Robert Wardrop & Luigi Zingales, 2020.
5. "Prediction, Judgment and Complexity: A Theory of Decision Making and Artificial Intelligence," (with Ajay Agrawal and Avi Goldfarb) in Ajay Agrawal et.al. (eds.), *Economics of Artificial Intelligence*, NBER, Chicago University Press, 2018.
6. "The Giant's Shoulders," in Stephen M. Maurer (ed.), *On the Shoulders of Giants: Colleagues Remember Suzanne Scotchmer's Contributions to Economics*, Cambridge University Press, 2017, Chapter 14.
7. "Surviving disruptive innovation," in Joshua Gans and Sarah Kaplan (eds), *Survive and Thrive: Winning Against Strategic Threats to Your Business*, DogEar: Toronto, Chapter 6.

8. "Economics of Innovation," in Roger D. Blair and D. Daniel Sokol (eds), *The Cambridge Handbook of Antitrust, Intellectual Property, and High Tech*, Cambridge University Press: Cambridge, 2017, Chapter 1.
9. "Some Economics of Pure Digital Currencies," (with Hanna Halaburda), *Economics of Digitization: An Agenda*, A. Goldfarb, S. Greenstein and C. Tucker (eds), NBER, 2015, Chapter 9.
10. "Credit History: The Changing Nature of Scientific Credit" (with Fiona Murray), in A. Jaffe and B. Jones (eds), *The Changing Frontier*, NBER, 2015, Chapter 4.
11. "Intel and Blocking Practices," *The Antitrust Revolution*, 6th ed., J. Kwoka and L. White (eds)., 2013.
12. "Nash Equilibrium," *Palgrave Encyclopedia of Strategic Management* (forthcoming).
13. "Natural Monopoly," *Palgrave Encyclopedia of Strategic Management* (forthcoming).
14. "Funding Scientific Knowledge: Selection, Disclosure and the Public-Private Portfolio," (with Fiona Murray) *Rate and Direction of Inventive Activity*, J. Lerner and S. Stern (eds), NBER, 2012 , Chpt 4.
15. "Regulating Interconnection Pricing," (with Richard Hayes and Stephen King), *Australian Telecommunications Regulation*, A. Grant (ed.), CCH: Sydney, 2012.
16. "Designing Markets for Ideas," (with Scott Stern) in *The Handbook of Market Design* (Edited by Zvika Neeman, Muriel Niederle, Nir Vulkan, and Al Roth), Oxford University Press, 2011
17. "Economic Approaches to Understanding and Promoting Innovation," in L. Mann and J. Chan (eds), *Creativity and Innovation in Business and Beyond*, Routledge: London, 2010, pp.82-104.
18. "Managing Ideas: Commercialization Strategies for Biotechnology," in C. Sri Krishna (ed.), *IPR and Commercialization: Economic Issues and Implications*, Amicus Books, Hyderabad, 2007, Chapter 6.
19. "Monopolistic Competition," *International Encyclopedia of Social Science*, (forthcoming).
20. "Housing and Income Contingent Loans for Low Income Households," (with Stephen King) *Managing Government Risk: Income contingent loans for social and economic progress*, Bruce Chapman (ed.), Routledge: London, 2006, Chapter 11.
21. "Access Pricing and Infrastructure Investment," in Dewenter, Ralf and Haucap, Justus (eds.) *Access Pricing: Theory and Practice*, Elsevier Science, Amsterdam, 2007, Chpt 2.
22. "Wireless Communications," (with Stephen King and Julian Wright) *Handbook of Telecommunications Economics*, North-Holland, 2005.
23. "Regulating Interconnection Pricing," (with Stephen King), *Australian Telecommunications Regulation*, A. Grant (ed.), UNSW Press: Sydney, 2003.
24. "Innovation and Market Structure in General Equilibrium," (with Robin Stonecash), in A. Woodland (ed.), *International Trade and Economic Theory: Essays in Honor of Murray Kemp*, Edward Elgar: Cheltnam, 2001, pp.181-191.
25. "Engendering Change," in S. Keen et.al. (eds.), *Commerce, Complexity, and Evolution*, Cambridge University Press: New York, 2000, Chpt 19, pp.391-414.
26. "A Strategic Theory of In-House Research and Development," in S. MacDonald and J. Nightingale (eds.), *Information and Organization*, Elsevier: Amsterdam, 1999, pp.167-182.
27. "A Primer on Access Regulation and Investment" (with Philip Williams), in M. Arblaster and M. Jamison (eds.), *Infrastructure Regulation and Market Reform: Principles and Practice*, ACCC/PURC: Melbourne, 1998, pp.150-160.
28. "Industrialisation Policy and the Big Push," in K.J. Arrow et.al. (eds.) *Increasing Returns and Economic Analysis*, Macmillan: London, 1998, Chpt 13.

Other Working Papers

1. "When Will Efficient Ownership Arise? Trading over Property Rights" 31st March, 2005
2. "Intrafirm Bargaining with Heterogeneous Replacement Workers" (with Catherine de Fontenay) June, 2005
3. "The Dynamics of Intellectual Property Practices" September, 2005
4. "The Economics of User-Based Innovation" (with Scott Stern) October, 1998

5. "Has Investment in Start-Up Firms Driven Incumbent Innovative Strategy? Evidence from Semiconductor and Biotechnology Venture Capital Funded Firms" (with Setio Anggoro Dewo and Joseph Hirschberg) July 2005
6. "Options for Housing Policy for Low Income Households," (with Stephen King), *Working Paper*, Menzies Research Centre, 2003.
7. "Assessing Australia's Innovative Capacity in the 21st Century," (with Scott Stern), *Working Paper*, MBS.
8. "Incentive Contracts, Optimal Penalties and Enforcement," Working Paper, No.6, MBS, January 1998.
9. "The Allocation of Decisions in Organizations," (with Susan Athey, Scott Schaefer and Scott Stern) *Discussion Paper*, No.1322, Graduate School of Business, Stanford University, October 1994.
10. "Monopolistic Competition a la Dixit and Stiglitz (and its Applications)," *Working Paper*, No.9409, Department of Economics, University of New South Wales, October 1994.
11. "The Cyclical Responsiveness of Shifts in Employment Over Sectors," (with Roberto Mazzoleni), *Quaderni Dell'Istituteo Di Scienze Economiche e Finanziarie*, No.15, Universita Degli Studi Di Cagliari Sacolta Di Scienze Politiche, January 1993, 19pp.

Blog Contributions

Plugging the Gap: joshuagans.substack.com
Digitopoly: digitopoly.org
Parentonomics: blogs.forbes.com/joshuagans
Core Economics: economics.com.au
Game Theorist: gametheorist.blogspot.com
News for Econ Students: econblog.aplia.com

Other Professional Activities

Executive Committee, Strategic Research Initiative (2012 – 2013, 2015-2024)
Department Editor, *Management Science* (Strategy) (2010 -)
Associate Editor, *Journal of Industrial Economics* (2009 -)
Co-Editor, *International Journal of Industrial Organization* (2005 - 2011)
Co-Editor, *Journal of Economics and Management Strategy* (2003 - 2008)
Board of Editors, *Review of Network Economics* (2009 - 2015)
Board of Editors, *Economic Analysis and Policy* (2007 - 2012)
Board of Editors, *Games* (2009 – 2021)
Economics Editor, *Australian Journal of Management* (1997 - 2003)
Board of Editors, *Information Economics and Policy* (1996 - 2004).
Board of Editors, *BE Journals of Economic Analysis and Policy* (2001 - 2015)
Book Review Editor (Microeconomics) for the *Economic Record* (1996 - 1998)
Executive Committee Member, Institute for a Broadband-Enabled Society, University of Melbourne
Professional Memberships: Economic Society of Australia, American Economic Association, Econometric Society, Law Council of Australia (Business Law Section), Canadian Bar Association (Competition Law Section).

Languages: Intermediate Japanese

APPENDIX B
Testifying experience

ICON Foundation v Mark Shin, United States District Court for the Northern District of California Case No.3:20-CV-07363-WHO (Report Feb 15, 2023)

Maximilian Klein, et al., on behalf of themselves and all others similarly situated, v. Meta Platforms, Inc., U.S. District Court for the Northern District of California Case No. 3:20-cv-08570-JD (Report, July 7, 2023; Reply report, Sept 1, 2023; deposition)

Michael Terpin v AT&T Mobility, U.S. District Court for the Central District of California, Western Division Case No. 2:18-cv-06975-ODW-KS (Report, December 5, 2022; deposition)

Hub Token and Eric Ly v. AT&T Mobility, American Arbitration Association, Case No.1-20-0000-4297 (Report May 21, 2021, deposition, testimony)

Dr Seuss vs ComicMix U.S. District Court for the Southern District of California Case No.16-CV-2779 (JLS, BGS) (Report, September 28, 2018; Second Report, November 5, 2018; Deposition)

General Motors LLC Ignition Switch Litigation U.S. District Court for the Southern District of New York Case No.14-MD-2543 (JMF) (Report, July 28, 2018; Second Report, August 30, 2018; Deposition)

Certain Integrated Circuits with Voltage Regulators and Products Containing Some (R2 Semiconductors v Intel, Dell and Hewlett Packard) U.S. International Trade Commission Investigation No.337-TA-1024 (Report, April 28, 2017; Rebuttal, May 12, 2017; Deposition)

Determination of Rates and Terms for Making and Distributing Phonorecords (Phonorecords III) Copyright Royalty Board Docket No: 16-CRB-0003-PR (2018-2022) (Report, October 31, 2016; Rebuttal February 2, 2017; Deposition; Testimony)

Whirlpool Corp Front-Loading Washer Products Liability Litigation
U.S. District Court for the Northern District of Ohio, Eastern Division
Case No: 1:08-wp-65000, MDL No.2001, Class Action (Report, May 10, 2013; Deposition; Testimony)

APPENDIX C
Materials Relied Upon & Materials Considered

MATERIALS RELIED UPON

All documents and sources referred to and cited in Professor Gans' report and its footnotes, including Bates-stamped documents, deposition transcripts, and other sources.

MATERIALS CONSIDERED

Discovery Responses
All available discovery responses produced within the matter of *The State of Texas, et al. v. Google*, Case Number: 4:20-cv-00957-SDJ, including:

1. The Parties' amended initial disclosures;
2. The Parties' discovery responses and objections to Interrogatories, Requests for Admission, and Requests for Production; and
3. Google's written responses to Plaintiffs' Rule 30(b)(6) Notice.

Deposition Transcripts & Exhibits
All available deposition transcripts and exhibits within the matter of *The State of Texas, et al. v. Google*, Case Number: 4:20-cv-00957-SDJ, including:

1. Deposition and Exhibits of [redacted]
2. Deposition and Exhibits of [redacted]
3. Deposition and Exhibits of [redacted]
4. Deposition and Exhibits of [redacted]
5. Deposition and Exhibits of [redacted]
6. Deposition and Exhibits of [redacted]
7. Deposition and Exhibits of [redacted]
8. Deposition and Exhibits of [redacted]
9. Deposition and Exhibits of [redacted]
10. Deposition and Exhibits of [redacted]
11. Deposition and Exhibits of [redacted]
12. Deposition and Exhibits of [redacted]
13. Deposition and Exhibits of [redacted]
14. Deposition and Exhibits of [redacted]
15. Deposition and Exhibits of [redacted]
16. Deposition and Exhibits of [redacted]
17. Deposition and Exhibits of [redacted]
18. Deposition and Exhibits of [redacted]
19. Deposition and Exhibits of [redacted]
20. Deposition and Exhibits of [redacted]
21. Deposition and Exhibits of [redacted]
22. Deposition and Exhibits of [redacted]

23. Deposition and Exhibits of [redacted]
24. Deposition and Exhibits of [redacted]
25. Deposition and Exhibits of [redacted]
26. Deposition and Exhibits of [redacted]
27. Deposition and Exhibits of [redacted]
28. Deposition and Exhibits of [redacted]
29. Deposition and Exhibits of [redacted]
30. Deposition and Exhibits of [redacted]
31. Deposition and Exhibits of [redacted]
32. Deposition and Exhibits of [redacted]
33. Deposition and Exhibits of [redacted]
34. Deposition and Exhibits of [redacted]
35. Deposition and Exhibits of [redacted]
36. Deposition and Exhibits of [redacted]
37. Deposition and Exhibits of [redacted]
38. Deposition and Exhibits of [redacted]
39. Deposition and Exhibits of [redacted]
40. Deposition and Exhibits of [redacted]
41. Deposition and Exhibits of [redacted]
42. Deposition and Exhibits of [redacted]
43. Deposition and Exhibits of [redacted]
44. Deposition and Exhibits of [redacted]
45. Deposition and Exhibits of Florida [redacted]
46. Deposition and Exhibits of [redacted]
47. Deposition and Exhibits of [redacted]
48. Deposition and Exhibits of [redacted]
49. Deposition and Exhibits of [redacted]
50. Deposition and Exhibits of [redacted]
51. Deposition and Exhibits of [redacted]
52. Deposition and Exhibits of South Carolina ([redacted]), April 23, 2024
53. Deposition and Exhibits of Indiana ([redacted]), April 26, 2024
54. Deposition and Exhibits of Indiana ([redacted]), April 26, 2024
55. Deposition and Exhibits of Nevada ([redacted]), April 29, 2024
56. Deposition and Exhibits of Arkansas ([redacted]), May 1, 2024
57. Deposition and Exhibits of Alaska ([redacted]), May 3, 2024
58. Deposition and Exhibits of Florida ([redacted]), April 22, 2024
59. Deposition and Exhibits of Idaho ([redacted]), May 3, 2024
60. Deposition and Exhibits of Idaho ([redacted]), May 3, 2024
61. Deposition and Exhibits of Kentucky ([redacted]), April 25, 2024
62. Deposition and Exhibits of Louisiana ([redacted]), May 3, 2024
63. Deposition and Exhibits of Mississippi ([redacted]), April 25, 2024

64. Deposition and Exhibits of Mississippi ([redacted]), April 25, 2024
65. Deposition and Exhibits of Missouri ([redacted]), May 10, 2024
66. Deposition and Exhibits of Montana ([redacted]), May 1, 2024
67. Deposition and Exhibits of North Dakota ([redacted]), May 2, 2024
68. Deposition and Exhibits of Puerto Rico ([redacted]), May 1, 2024
69. Deposition and Exhibits of South Dakota ([redacted]), April 29, 2024
70. Deposition and Exhibits of Texas ([redacted]), May 24, 2024
71. Deposition and Exhibits of Texas ([redacted]), April 17, 2024
72. Deposition and Exhibits of Utah ([redacted]), April 30, 2024
73. Deposition and Exhibits of Utah ([redacted]), April 30, 2024
74. Deposition and Exhibits of [redacted]
75. Deposition and Exhibits of [redacted]
76. Deposition and Exhibits of [redacted]
77. Deposition and Exhibits of [redacted]
78. Deposition and Exhibits of [redacted]
79. Deposition and Exhibits of [redacted]
80. Deposition and Exhibits of [redacted]
81. Deposition and Exhibits of [redacted]
82. Deposition and Exhibits of Tex[redacted]
83. Deposition and Exhibits of [redacted]
84. Deposition and Exhibits of [redacted]

All available deposition transcripts and exhibits within the matter of *USA v. Google*, Case Number: 1:23-cv-00108-LMB-JFA, including:

85. Deposition and Exhibits of [redacted]
86. Deposition and Exhibits of [redacted]
87. Deposition and Exhibits of [redacted]
88. Deposition and Exhibits of [redacted]
89. Deposition and Exhibits of [redacted]
90. Deposition and Exhibits of [redacted]
91. Deposition and Exhibits of [redacted]
92. Deposition and Exhibits of [redacted]
93. Deposition and Exhibits of [redacted]
94. Deposition and Exhibits of [redacted]
95. Deposition and Exhibits of [redacted]
96. Deposition and Exhibits of [redacted]

97. Deposition and Exhibits of [redacted]
98. Deposition and Exhibits of [redacted]
99. Deposition and Exhibits of [redacted]
100. Deposition and Exhibits of [redacted]
101. Deposition and Exhibits of [redacted]
102. Deposition and Exhibits of [redacted]
103. Deposition and Exhibits of [redacted]
104. Deposition and Exhibits of [redacted]
105. Deposition and Exhibits of [redacted]
106. Deposition and Exhibits of [redacted]
107. Deposition and Exhibits of [redacted]
108. Deposition and Exhibits of [redacted]
109. Deposition and Exhibits of [redacted]

110. Deposition and Exhibits of [redacted]
111. Deposition and Exhibits of [redacted]
112. Deposition and Exhibits of [redacted]
113. Deposition and Exhibits of [redacted]
114. Deposition and Exhibits of [redacted]
115. Deposition and Exhibits of [redacted]
116. Deposition and Exhibits of [redacted]
117. Deposition and Exhibits of [redacted]
118. Deposition and Exhibits of [redacted]
119. Deposition and Exhibits of [redacted]
120. Deposition and Exhibits of [redacted]
121. Deposition and Exhibits of [redacted]
122. Deposition and Exhibits of [redacted]
123. Deposition and Exhibits of [redacted]
124. Deposition and Exhibits of [redacted]
125. Deposition and Exhibits of [redacted]
126. Deposition and Exhibits of [redacted]
127. Deposition and Exhibits of [redacted]
128. Deposition and Exhibits of [redacted]
129. Deposition and Exhibits of [redacted]
130. Deposition and Exhibits of [redacted]
131. Deposition and Exhibits of [redacted]
132. Deposition and Exhibits of [redacted]
133. Deposition and Exhibits of [redacted]
134. Deposition and Exhibits of [redacted]
135. Deposition and Exhibits of [redacted]
136. Deposition and Exhibits of [redacted]
137. Deposition and Exhibits of [redacted]
138. Deposition and Exhibits of [redacted]

Expert Reports & Declarations

All available expert reports (with redactions) within the matter of *USA v. Google*, Case Number: 1:23-cv-00108-LMB-JFA, including:

1. Declarations of Google Employees
2. 2023.12.22 Expert Report of Gabriel Weintraub, GOOG-AT-MDL-C-000018734
3. 2023.12.22 Expert Report of R. Ravi, GOOG-AT-MDL-C-000019017
4. 2023.12.22 Expert Report of Robin S. Lee, GOOG-AT-MDL-C-000019273
5. 2023.12.22 Expert Report of Rosa Abrantes-Metz, GOOG-AT-MDL-C-000019786
6. 2023.12.22 Expert Report of Thomas S. Respess, GOOG-AT-MDL-C-000020106
7. 2023.12.22 Expert Report of Timothy Simcoe, GOOG-AT-MDL-C-000020274
8. 2024.01.13 Errata to Abrantes-Metz Expert Report, GOOG-AT-MDL-C-000020435
9. 2024.01.13 Errata to Ravi Expert Report, GOOG-AT-MDL-C-000020437
10. 2024.01.13 Errata to Respess Expert Report, GOOG-AT-MDL-C-000020440
11. 2024.01.13 Errata to Simcoe Expert Report, GOOG-AT-MDL-C-000020467
12. 2024.01.13 Errata to Weintraub Expert Report, GOOG-AT-MDL-C-000020471
13. 2024.01.23 Chevalier Expert Report, GOOG-AT-MDL-C-000020474
14. 2024.01.23 Ferrante Expert Report, GOOG-AT-MDL-C-000020714
15. 2024.01.23 Ghose Expert Report, GOOG-AT-MDL-C-000020767
16. 2024.01.23 Israel Expert Report, GOOG-AT-MDL-C-000021036
17. 2024.01.23 Milgrom Expert Report, GOOG-AT-MDL-C-000021794
18. 2024.01.23 Rinard Expert Report, GOOG-AT-MDL-C-000022191
19. 2024.01.23 Shirky Expert Report, GOOG-AT-MDL-C-000022229
20. 2024.01.23 Simonson Expert Report, GOOG-AT-MDL-C-000022290
21. 2024.01.23 Skinner Expert Report, GOOG-AT-MDL-C-000022948
22. 2024.02.13 Expert Rebuttal Report of Adoria Lim, GOOG-AT-MDL-C-000023002
23. 2024.02.13 Expert Rebuttal Report of Gabriel Weintraub, GOOG-AT-MDL-C-000023226
24. 2024.02.13 Expert Rebuttal Report of Kenneth Wilbur, GOOG-AT-MDL-C-000023322
25. 2024.02.13 Expert Rebuttal Report of R. Ravi, GOOG-AT-MDL-C-000023435
26. 2024.02.13 Expert Rebuttal Report of Robin S. Lee, GOOG-AT-MDL-C-000023516
27. 2024.02.13 Expert Rebuttal Report of Rosa Abrantes-Metz, GOOG-AT-MDL-C-000023887
28. 2024.02.13 Expert Rebuttal Report of Timothy Simcoe, GOOG-AT-MDL-C-000024064
29. 2024.02.13 Expert Rebuttal Report of Wayne Hoyer, GOOG-AT-MDL-C-000024138

30. 2024.02.13 Expert Rebuttal Report of Wenke Lee, GOOG-AT-MDL-C-000024270
31. 2024.02.16 Errata to Ravi Rebuttal Report, GOOG-AT-MDL-C-000024387
32. 2024.02.20 Errata to Simcoe Rebuttal Report, GOOG-AT-MDL-C-000024389
33. 2024.02.23 Errata to Weintraub Rebuttal Report, GOOG-AT-MDL-C-000024390
34. 2024.02.23 Supplemental Errata to Weintraub Expert Report, GOOG-AT-MDL-C-000024391
35. 2024.02.24 Errata to Wilbur Rebuttal Report, GOOG-AT-MDL-C-000024392
36. 2024.02.26 Errata to Hoyer Rebuttal Report, GOOG-AT-MDL-C-000024397
37. 2024.02.28 Errata to Abrantes-Metz Rebuttal Report, GOOG-AT-MDL-C-000024399
38. 2024.03.04 Expert Supplemental Report of Robin S. Lee, GOOG-AT-MDL-C-000024403
39. 2024.03.08 Consolidated Errata to Lee Rebuttal Report, GOOG-AT-MDL-C-000024436
40. 2024.01.13 Expert Report of Weintraub Errata, GOOG-AT-MDL-C-000040965
41. 2024.01.13 Expert Report of Simcoe Errata, GOOG-AT-MDL-C-000040961
42. 2024.01.13 Expert Report of Respess Errata_with Figure Errata_Redacted, GOOG-AT-MDL-C-000040934
43. 2024.01.13 Expert Report of R Ravi Errata, GOOG-AT-MDL-C-000040931
44. 2024.01.13 Expert Report of Abrantes-Metz Errata, GOOG-AT-MDL-C-000040929
45. 2024.03.08 Consolidated Errata to Lee Rebuttal Report, GOOG-AT-MDL-C-000040926
46. 2024.03.04 Expert Supplemental Report of Robin S. Lee, PhD, GOOG-AT-MDL-C-000040893
47. 2024.02.28 Rebuttal Report Errata of Rosa Abrantes-Metz Signed, GOOG-AT-MDL-C-000040889
48. 2024.02.25 Expert Rebuttal Report of Hoyer Errata, GOOG-AT-MDL-C-000040887
49. 2024.02.24 Wilbur Rebuttal Errata, GOOG-AT-MDL-C-000040882
50. 2024.02.23 Weintraub Rebuttal Report Errata, GOOG-AT-MDL-C-000040881
51. 2024.02.23 Expert Report of Weintraub Supplemental Errata, GOOG-AT-MDL-C-000040880
52. 2024.02.20 Errata to Simcoe Rebuttal Report, GOOG-AT-MDL-C-000040879
53. 2024.02.16 Errata to Ravi Rebuttal Report (Highly Confidential), GOOG-AT-MDL-C-000040877
54. 2024.02.13 Rebuttal Report of Rosa Abrantes-Metz, GOOG-AT-MDL-C-000040700
55. 2024.02.13 Expert Report of Wenke Lee, GOOG-AT-MDL-C-000040583
56. 2024.02.13 Expert Rebuttal Report of Wayne Hoyer, GOOG-AT-MDL-C-000040451
57. 2024.02.13 Expert Rebuttal Report of Timothy Simcoe_Redacted, GOOG-AT-MDL-C-000040377
58. 2024.02.13 Expert Rebuttal Report of Robin S. Lee_Redacted, GOOG-AT-MDL-C-000040006
59. 2024.02.13 Expert Rebuttal Report of R Ravi, GOOG-AT-MDL-C-000039925

60. 2024.02.13 Expert Rebuttal Report of Kenneth Wilbur_Redacted, GOOG-AT-MDL-C-000039812
61. 2024.02.13 Expert Rebuttal Report of Gabriel Weintraub_Redacted, GOOG-AT-MDL-C-000039716
62. 2024.02.13 Expert Rebuttal Report of Adoria Lim_Redacted, GOOG-AT-MDL-C-000039492
63. 2024.01.23 Expert Report of William Clay Shirky, GOOG-AT-MDL-C-000039431
64. 2024.01.23 Expert Report of Paul R. Milgrom, GOOG-AT-MDL-C-000039034
65. 2024.01.23 Expert Report of Martin C. Rinard, GOOG-AT-MDL-C-000038996
66. 2024.01.23 Expert Report of Mark A. Israel_Redacted, GOOG-AT-MDL-C-000038238
67. 2024.01.23 Expert Report of Judith A. Chevalier_Redacted, GOOG-AT-MDL-C-000037998
68. 2024.01.23 Expert Report of Itamar Simonson, GOOG-AT-MDL-C-000037340
69. 2024.01.23 Expert Report of Douglas Skinner, GOOG-AT-MDL-C-000037286
70. 2024.01.23 Expert Report of Anthony J. Ferrante, GOOG-AT-MDL-C-000037233
71. 2024.01.23 Expert Report of Anindya Ghose_Redacted, GOOG-AT-MDL-C-000036954
72. 2023.12.22 Expert Report of Timothy Simcoe_Redacted, GOOG-AT-MDL-C-000036793
73. 2023.12.22 Expert Report of Thomas Respess_Redacted, GOOG-AT-MDL-C-000036625
74. 2023.12.22 Expert Report of Rosa Abrantes-Metz_Redacted, GOOG-AT-MDL-C-000036305
75. 2023.12.22 Expert Report of Robin S. Lee, PhD_Redacted, GOOG-AT-MDL-C-000035792
76. 2023.12.22 Expert Report of R Ravi_Redacted, GOOG-AT-MDL-C-000035536
77. 2023.12.22 Expert Report of Gabriel Weintraub_Redacted, GOOG-AT-MDL-C-000035253

Bates Stamped Productions, including:

1. [redacted]0027446
2. [redacted]_000000680
3. [redacted]_00478712
4. [redacted]_00986815
5. [redacted]_01484801
6. [redacted]_00078430
7. [redacted]_00079937
8. [redacted]_00116640 / [redacted]_00116632
9. [redacted]_00277880
10. [redacted]_00327692
11. [redacted]_00327637 / [redacted]_00327634
12. [redacted]_00327690
13. [redacted]_00334404
14. [redacted]_00482531
15. [redacted]_00528526
16. [redacted]_00540345
17. [redacted]_00585545 / [redacted]_00585544
18. [redacted]_00797666
19. [redacted]_00808277
20. [redacted]_00813671
21. [redacted]_00837148
22. [redacted]_00854833
23. [redacted]_00892345
24. [redacted]_00969349
25. [redacted]_01003026
26. [redacted]_01021169
27. [redacted]_01062704
28. [redacted]_01064247
29. [redacted]_01064318
30. [redacted]_01080688
31. [redacted]_01082050
32. [redacted]_01089475
33. [redacted]_01103919
34. [redacted]_01131531
35. [redacted]_01200160
36. [redacted]_01254367
37. [redacted]_01274568
38. [redacted]_00528334
39. [redacted]-000004531
40. GOOG-AT-MDL-001263607
41. GOOG-AT-MDL-001390730
42. GOOG-AT-MDL-001391213
43. GOOG-AT-MDL-001933227
44. GOOG-AT-MDL-002105969
45. GOOG-AT-MDL-002105984
46. GOOG-AT-MDL-002124829
47. GOOG-AT-MDL-002390899

48. GOOG-AT-MDL-002393442
49. GOOG-AT-MDL-003161451
50. GOOG-AT-MDL-004074544
51. GOOG-AT-MDL-004232880
52. GOOG-AT-MDL-004233138
53. GOOG-AT-MDL-004300268
54. GOOG-AT-MDL-004416785
55. GOOG-AT-MDL-004436768
56. GOOG-AT-MDL-004555181
57. GOOG-AT-MDL-006099844
58. GOOG-AT-MDL-006161050
59. GOOG-AT-MDL-006334729
60. GOOG-AT-MDL-006873424
61. GOOG-AT-MDL-006966530
62. GOOG-AT-MDL-007175167
63. GOOG-AT-MDL-007343585
64. GOOG-AT-MDL-007346556
65. GOOG-AT-MDL-007364833
66. GOOG-AT-MDL-007375672
67. GOOG-AT-MDL-007387750
68. GOOG-AT-MDL-007397182
69. GOOG-AT-MDL-007397197
70. GOOG-AT-MDL-008148533 / GOOG-AT-MDL-008148529
71. GOOG-AT-MDL-008517788
72. GOOG-AT-MDL-008588684
73. GOOG-AT-MDL-008682082 / GOOG-AT-MDL-008682071
74. GOOG-AT-MDL-008754374
75. GOOG-AT-MDL-008835346
76. GOOG-AT-MDL-008858602
77. GOOG-AT-MDL-008881206
78. GOOG-AT-MDL-008886980
79. GOOG-AT-MDL-008953893
80. GOOG-AT-MDL-008964888
81. GOOG-AT-MDL-008979664
82. GOOG-AT-MDL-008991390
83. GOOG-AT-MDL-009026140
84. GOOG-AT-MDL-009289718
85. GOOG-AT-MDL-009291120
86. GOOG-AT-MDL-009299907
87. GOOG-AT-MDL-009321580
88. GOOG-AT-MDL-009429957
89. GOOG-AT-MDL-012512067
90. GOOG-AT-MDL-012514705
91. GOOG-AT-MDL-012524006
92. GOOG-AT-MDL-012549335
93. GOOG-AT-MDL-012693796
94. GOOG-AT-MDL-012767138
95. GOOG-AT-MDL-012837016
96. GOOG-AT-MDL-012857198
97. GOOG-AT-MDL-013290688
98. GOOG-AT-MDL-013291089

99. GOOG-AT-MDL-013292974
100. GOOG-AT-MDL-013299524
101. GOOG-AT-MDL-013299531
102. GOOG-AT-MDL-013300202
103. GOOG-AT-MDL-013378392
104. GOOG-AT-MDL-013908958
105. GOOG-AT-MDL-013918668
106. GOOG-AT-MDL-014427012
107. GOOG-AT-MDL-014460206
108. GOOG-AT-MDL-014462378
109. GOOG-AT-MDL-014486274
110. GOOG-AT-MDL-014524447
111. GOOG-AT-MDL-014618288
112. GOOG-AT-MDL-015241235
113. GOOG-AT-MDL-015622194
114. GOOG-AT-MDL-015844174
115. GOOG-AT-MDL-015929587
116. GOOG-AT-MDL-015997353
117. GOOG-AT-MDL-016457027
118. GOOG-AT-MDL-016534880
119. GOOG-AT-MDL-016627159
120. GOOG-AT-MDL-016656237
121. GOOG-AT-MDL-016772599
122. GOOG-AT-MDL-016838311
123. GOOG-AT-MDL-016924839
124. GOOG-AT-MDL-016937590
125. GOOG-AT-MDL-016943922
126. GOOG-AT-MDL-016967094
127. GOOG-AT-MDL-017187837
128. GOOG-AT-MDL-017394050
129. GOOG-AT-MDL-017494582
130. GOOG-AT-MDL-017664768
131. GOOG-AT-MDL-017746412
132. GOOG-AT-MDL-017749638
133. GOOG-AT-MDL-017762649
134. GOOG-AT-MDL-017864022
135. GOOG-AT-MDL-018248228
136. GOOG-AT-MDL-018427318
137. GOOG-AT-MDL-018448707
138. GOOG-AT-MDL-018548592
139. GOOG-AT-MDL-018618351
140. GOOG-AT-MDL-018652651
141. GOOG-AT-MDL-018998910
142. GOOG-AT-MDL-019001498
143. GOOG-AT-MDL-019306356
144. GOOG-AT-MDL-019386250
145. GOOG-AT-MDL-019552139
146. GOOG-AT-MDL-019571201
147. GOOG-AT-MDL-019588187
148. GOOG-AT-MDL-019633443
149. GOOG-AT-MDL-019642313

150.GOOG-AT-MDL-019653406
151.GOOG-AT-MDL-019721340
152.GOOG-AT-MDL-019767203
153.GOOG-AT-MDL-B-000134141
154.GOOG-AT-MDL-B-001084151
155.GOOG-AT-MDL-B-001140202
156.GOOG-AT-MDL-B-002087955
157.GOOG-AT-MDL-B-002088697
158.GOOG-AT-MDL-B-002088752
159.GOOG-AT-MDL-B-002088926
160.GOOG-AT-MDL-B-002090567
161.GOOG-AT-MDL-B-002091565
162.GOOG-AT-MDL-B-002095353
163.GOOG-AT-MDL-B-002095501
164.GOOG-AT-MDL-B-002095769
165.GOOG-AT-MDL-B-002097533
166.GOOG-AT-MDL-B-002097570
167.GOOG-AT-MDL-B-002097648
168.GOOG-AT-MDL-B-002098265
169.GOOG-AT-MDL-B-002099366
170.GOOG-AT-MDL-B-002105135
171.GOOG-AT-MDL-B-002500395
172.GOOG-AT-MDL-B-002514153
173.GOOG-AT-MDL-B-002547489
174.GOOG-AT-MDL-B-002552122
175.GOOG-AT-MDL-B-002624643
176.GOOG-AT-MDL-B-002760309
177.GOOG-AT-MDL-B-002762758
178.GOOG-AT-MDL-B-002763194
179.GOOG-AT-MDL-B-002764178
180.GOOG-AT-MDL-B-002764191
181.GOOG-AT-MDL-B-002797051
182.GOOG-AT-MDL-B-002803919
183.GOOG-AT-MDL-B-002837096
184.GOOG-AT-MDL-B-003181628
185.GOOG-AT-MDL-B-003735823
186.GOOG-AT-MDL-B-003741154
187.GOOG-AT-MDL-B-004008753
188.GOOG-AT-MDL-B-004015880
189.GOOG-AT-MDL-B-004016318
190.GOOG-AT-MDL-B-004243337
191.GOOG-AT-MDL-B-004247242
192.GOOG-AT-MDL-B-004265772
193.GOOG-AT-MDL-B-004425247
194.GOOG-AT-MDL-B-004680051
195.GOOG-AT-MDL-B-005083974
196.GOOG-AT-MDL-B-005167304
197.GOOG-AT-MDL-B-005168118
198.GOOG-AT-MDL-B-005170475
199.GOOG-AT-MDL-B-005282318
200.GOOG-AT-MDL-B-005372599

201.GOOG-AT-MDL-B-005457387
202.GOOG-AT-MDL-B-006069467
203.GOOG-AT-MDL-B-006316352
204.GOOG-AT-MDL-B-006365895
205.GOOG-AT-MDL-B-006365981
206.GOOG-AT-MDL-B-006939056
207.GOOG-AT-MDL-B-007212533
208.GOOG-AT-MDL-B-007229334
209.GOOG-AT-MDL-B-007232867
210.GOOG-AT-MDL-B-007353902
211.GOOG-DOJ-12948968
212.GOOG-DOJ-13897780
213.GOOG-DOJ-13899823
214.GOOG-DOJ-13911836
215.GOOG-DOJ-13930748
216.GOOG-DOJ-13940086
217.GOOG-DOJ-14008698
218.GOOG-DOJ-14034714
219.GOOG-DOJ-14113270
220.GOOG-DOJ-14139857
221.GOOG-DOJ-14155066
222.GOOG-DOJ-14156827
223.GOOG-DOJ-14161619
224.GOOG-DOJ-14161943
225.GOOG-DOJ-14232497
226.GOOG-DOJ-14352302
227.GOOG-DOJ-14352774
228.GOOG-DOJ-14365517
229.GOOG-DOJ-14433486
230.GOOG-DOJ-14433633
231.GOOG-DOJ-14435110
232.GOOG-DOJ-14436029
233.GOOG-DOJ-14453674
234.GOOG-DOJ-14458088
235.GOOG-DOJ-14494204
236.GOOG-DOJ-14544715
237.GOOG-DOJ-14544743
238.GOOG-DOJ-14556699
239.GOOG-DOJ-14712739
240.GOOG-DOJ-14717683
241.GOOG-DOJ-14733660
242.GOOG-DOJ-14735212
243.GOOG-DOJ-14735427
244.GOOG-DOJ-14740782
245.GOOG-DOJ-14743636
246.GOOG-DOJ-14870370
247.GOOG-DOJ-15021111
248.GOOG-DOJ-15022600
249.GOOG-DOJ-15022611
250.GOOG-DOJ-15029681
251.GOOG-DOJ-15041717

252. GOOG-DOJ-15042589
253. GOOG-DOJ-15064786
254. GOOG-DOJ-15071642
255. GOOG-DOJ-15073261
256. GOOG-DOJ-15076754
257. GOOG-DOJ-15140608
258. GOOG-DOJ-15173140
259. GOOG-DOJ-15186471
260. GOOG-DOJ-15278949
261. GOOG-DOJ-15371972
262. GOOG-DOJ-15417170
263. GOOG-DOJ-15426837
264. GOOG-DOJ-15427800
265. GOOG-DOJ-15428154
266. GOOG-DOJ-15432090
267. GOOG-DOJ-15433127
268. GOOG-DOJ-15434544
269. GOOG-DOJ-15445478
270. GOOG-DOJ-15526215
271. GOOG-DOJ-15590044
272. GOOG-DOJ-15595543
273. GOOG-DOJ-15597407
274. GOOG-DOJ-15598151
275. GOOG-DOJ-15601229
276. GOOG-DOJ-15616526
277. GOOG-DOJ-15621021
278. GOOG-DOJ-15628088
279. GOOG-DOJ-15631978
280. GOOG-DOJ-15637110
281. GOOG-DOJ-15675958
282. GOOG-DOJ-15733030
283. GOOG-DOJ-15766965
284. GOOG-DOJ-15789579
285. GOOG-DOJ-16271009
286. GOOG-DOJ-16732920
287. GOOG-DOJ-16976651
288. GOOG-DOJ-17101302
289. GOOG-DOJ-17105055
290. GOOG-DOJ-17581278
291. GOOG-DOJ-19090482
292. GOOG-DOJ-19119112
293. GOOG-DOJ-27760500_DUP_1
294. GOOG-DOJ-27762649
295. GOOG-DOJ-27762691
296. GOOG-DOJ-27796586
297. GOOG-DOJ-27803156
298. GOOG-DOJ-27803505
299. GOOG-DOJ-27803533
300. GOOG-DOJ-27804205
301. GOOG-DOJ-27804876
302. GOOG-DOJ-28385887

303. GOOG-DOJ-28420330
304. GOOG-DOJ-29427368
305. GOOG-DOJ-29453844
306. GOOG-DOJ-30066802
307. GOOG-DOJ-32018179
308. GOOG-DOJ-32018452
309. GOOG-DOJ-32022422
310. GOOG-DOJ-32062262
311. GOOG-DOJ-32262980
312. GOOG-DOJ-32265694
313. GOOG-DOJ-AT-00003565
314. GOOG-DOJ-AT-00087809
315. GOOG-DOJ-AT-00252559
316. GOOG-DOJ-AT-00569953
317. GOOG-DOJ-AT-00575435
318. GOOG-DOJ-AT-00588995
319. GOOG-DOJ-AT-00651561
320. GOOG-DOJ-AT-00663174
321. GOOG-DOJ-AT-00750354
322. GOOG-DOJ-AT-01019411
323. GOOG-DOJ-AT-01027937
324. GOOG-DOJ-AT-01514374
325. GOOG-DOJ-AT-01525829
326. GOOG-DOJ-AT-01682499
327. GOOG-DOJ-AT-01811246
328. GOOG-DOJ-AT-01814428
329. GOOG-DOJ-AT-01814688
330. GOOG-DOJ-AT-01815482
331. GOOG-DOJ-AT-01816686
332. GOOG-DOJ-AT-01848255
333. GOOG-DOJ-AT-01933085
334. GOOG-DOJ-AT-02070545
335. GOOG-DOJ-AT-02122748
336. GOOG-DOJ-AT-02146896
337. GOOG-DOJ-AT-02153612
338. GOOG-DOJ-AT-02275074
339. GOOG-DOJ-AT-02275933
340. GOOG-DOJ-AT-02319393
341. GOOG-DOJ-AT-02482767
342. GOOG-DOJ-AT-02634336
343. GOOG-DOJ-AT-02639830
344. GOOG-NE-01787563
345. GOOG-NE-02557667
346. GOOG-NE-02558055
347. GOOG-NE-03231727
348. GOOG-NE-03236272
349. GOOG-NE-03467508
350. GOOG-NE-03616222
351. GOOG-NE-03627597
352. GOOG-NE-03727939
353. GOOG-NE-03844060

354.GOOG-NE-03869994
355.GOOG-NE-03872605
356.GOOG-NE-04304005
357.GOOG-NE-04689402
358.GOOG-NE-05241137
359.GOOG-NE-05270679
360.GOOG-NE-06113062
361.GOOG-NE-06547825
362.GOOG-NE-06568562
363.GOOG-NE-06568719
364.GOOG-NE-06729717
365.GOOG-NE-06841582
366.GOOG-NE-07841238
367.GOOG-NE-07946731
368.GOOG-NE-08116078
369.GOOG-NE-08112779
370.GOOG-NE-09138394
371.GOOG-NE-09698556
372.GOOG-NE-09711564
373.GOOG-NE-10573952
374.GOOG-NE-10660658
375.GOOG-NE-10660882
376.GOOG-NE-10777158
377.GOOG-NE-10952313
378.GOOG-NE-10976657
379.GOOG-NE-10977717
380.GOOG-NE-10978402
381.GOOG-NE-10985565
382.GOOG-NE-11813912
383.GOOG-NE-11847370
384.GOOG-NE-11877282
385.GOOG-NE-12727978
386.GOOG-NE-12738745
387.GOOG-NE-12742008
388.GOOG-NE-12787759
389.GOOG-NE-12885078
390.GOOG-NE-13004102
391.GOOG-NE-13200100
392.GOOG-NE-13205235
393.GOOG-NE-13205865
394.GOOG-NE-13210272
395.GOOG-NE-13327192
396.GOOG-NE-13340752
397.GOOG-NE-13349343
398.GOOG-NE-13367768
399.GOOG-NE-13369624
400.GOOG-NE-13373170
401.GOOG-NE-13374150
402.GOOG-NE-13379438
403.GOOG-NE-13386334
404.GOOG-NE-13389481

405. GOOG-NE-13390045
406. GOOG-NE-13393115
407. GOOG-NE-13401911
408. GOOG-NE-13405025
409. GOOG-NE-13415537
410. GOOG-NE-13541543
411. GOOG-NE-13569193
412. GOOG-NE-13577462
413. GOOG-NE-13589899
414. GOOG-NE-13624783
415. GOOG-TEX-00039266
416. GOOG-TEX-00079344
417. GOOG-TEX-00089835
418. GOOG-TEX-00090151
419. GOOG-TEX-00090282
420. GOOG-TEX-00090969
421. GOOG-TEX-00092657
422. GOOG-TEX-00105202
423. GOOG-TEX-00105361
424. GOOG-TEX-00106255
425. GOOG-TEX-00109167
426. GOOG-TEX-00110068
427. GOOG-TEX-00110540
428. GOOG-TEX-00110544
429. GOOG-TEX-00111494
430. GOOG-TEX-00116069
431. GOOG-TEX-00116639
432. GOOG-TEX-00119737
433. GOOG-TEX-00119845
434. GOOG-TEX-00120626
435. GOOG-TEX-00120775
436. GOOG-TEX-00156142
437. GOOG-TEX-00167119
438. GOOG-TEX-00177559
439. GOOG-TEX-00206687
440. GOOG-TEX-00216163
441. GOOG-TEX-00234150
442. GOOG-TEX-00240572
443. GOOG-TEX-00270127
444. GOOG-TEX-00271177
445. GOOG-TEX-00309326
446. GOOG-TEX-00326649
447. GOOG-TEX-00336527
448. GOOG-TEX-00344083
449. GOOG-TEX-00370306
450. GOOG-TEX-00374779
451. GOOG-TEX-00375239
452. GOOG-TEX-00452866
453. GOOG-TEX-00513684
454. GOOG-TEX-00643890
455. GOOG-TEX-00689539

456. GOOG-TEX-00705131
457. GOOG-TEX-00715805
458. GOOG-TEX-00716782
459. GOOG-TEX-00777573
460. GOOG-TEX-00778301
461. GOOG-TEX-00797340
462. GOOG-TEX-00806640
463. GOOG-TEX-00806682
464. GOOG-TEX-00814407
465. GOOG-TEX-00825713
466. GOOG-TEX-00828547
467. GOOG-TEX-00831660
468. GOOG-TEX-00850729
469. GOOG-TEX-00858576
470. GOOG-TEX-00905673
471. GOOG-TEX-00959457
472. GOOG-TEX-00959461
473. GOOG-TEX-00969525
474. GOOG-TEX-00978814
475. GOOG-TEX-01004466
476. GOOG-TEX-01036150
477. GOOG-TEX-01142635
478. GOOG-TEX-01244428
479. GOOG-TEX-01279945
480. GOOG-TEX-00974499
481. GOOG-TEX-00001418
482. GOOG-TEX-00597317
483. [redacted] 000000680
484. [redacted] 090311
485. [redacted] -00000001
486. [redacted] -0000078
487. [redacted] -00108842
488. [redacted] _00983740
489. [redacted] _01177704
490. GOOG-AT-EDVA-DATA-000000386
491. GOOG-AT-MD-002112607
492. GOOG-AT-MDL-000010615
493. GOOG-AT-MDL-000993483
494. GOOG-AT-MDL-001001031
495. GOOG-AT-MDL-001158517
496. GOOG-AT-MDL-001283797
497. GOOG-AT-MDL-001393488
498. GOOG-AT-MDL-001412616
499. GOOG-AT-MDL-001414841
500. GOOG-AT-MDL-001963111
501. GOOG-AT-MDL-002003596
502. GOOG-AT-MDL-002167993
503. GOOG-AT-MDL-002315489
504. GOOG-AT-MDL-002332628
505. GOOG-AT-MDL-002410207
506. GOOG-AT-MDL-002432030

507. GOOG-AT-MDL-002432561
508. GOOG-AT-MDL-002468738
509. GOOG-AT-MDL-00311031
510. GOOG-AT-MDL-003157013
511. GOOG-AT-MDL-003407129
512. GOOG-AT-MDL-004028122
513. GOOG-AT-MDL-004068636
514. GOOG-AT-MDL-004216976
515. GOOG-AT-MDL-004224466
516. GOOG-AT-MDL-004232662
517. GOOG-AT-MDL-004233324
518. GOOG-AT-MDL-004285799
519. GOOG-AT-MDL-004406311
520. GOOG-AT-MDL-004421046
521. GOOG-AT-MDL-004487414
522. GOOG-AT-MDL-004555625
523. GOOG-AT-MDL-004586676
524. GOOG-AT-MDL-006188008
525. GOOG-AT-MDL-006188040
526. GOOG-AT-MDL-006197379
527. GOOG-AT-MDL-006218257
528. GOOG-AT-MDL-006223787
529. GOOG-AT-MDL-006225513
530. GOOG-AT-MDL-006225562
531. GOOG-AT-MDL-006226679
532. GOOG-AT-MDL-006227065
533. GOOG-AT-MDL-006228388
534. GOOG-AT-MDL-006236069
535. GOOG-AT-MDL-006236676
536. GOOG-AT-MDL-006331892
537. GOOG-AT-MDL-006690096
538. GOOG-AT-MDL-006690491
539. GOOG-AT-MDL-006692053
540. GOOG-AT-MDL-006759322
541. GOOG-AT-MDL-006856016
542. GOOG-AT-MDL-006988892
543. GOOG-AT-MDL-007179303
544. GOOG-AT-MDL-007244373
545. GOOG-AT-MDL-007290589
546. GOOG-AT-MDL-007346336
547. GOOG-AT-MDL-007348096
548. GOOG-AT-MDL-007367804
549. GOOG-AT-MDL-007367883
550. GOOG-AT-MDL-007373282
551. GOOG-AT-MDL-007476950
552. GOOG-AT-MDL-007527888
553. GOOG-AT-MDL-007934013
554. GOOG-AT-MDL-008093075
555. GOOG-AT-MDL-008105248
556. GOOG-AT-MDL-008110742
557. GOOG-AT-MDL-008190487

558. GOOG-AT-MDL-008359792
559. GOOG-AT-MDL-008708337
560. GOOG-AT-MDL-008913419
561. GOOG-AT-MDL-008914548
562. GOOG-AT-MDL-008916128
563. GOOG-AT-MDL-009025096
564. GOOG-AT-MDL-013183476
565. GOOG-AT-MDL-016421744
566. GOOG-AT-MDL-DATA-000558890
567. GOOG-AT-MDL-DATA-000559276
568. GOOG-AT-MDL-DATA-000559277-61030
569. GOOG-AT-MDL-DATA-000561421
570. GOOG-DOJ-02274670
571. GOOG-DOJ-06571334
572. GOOG-DOJ-10961351
573. GOOG-DOJ-13920561
574. GOOG-DOJ-13974611
575. GOOG-DOJ-14031285
576. GOOG-DOJ-14143067
577. GOOG-DOJ-14323586
578. GOOG-DOJ-14566285
579. GOOG-DOJ-1471520
580. GOOG-DOJ-14743824
581. GOOG-DOJ-15125123
582. GOOG-DOJ-15235795
583. GOOG-DOJ-15366051
584. GOOG-DOJ-15366121
585. GOOG-DOJ-27712490
586. GOOG-DOJ-28250391
587. GOOG-DOJ-28385887
588. GOOG-DOJ-32260077
589. GOOG-DOJ-32302670
590. GOOG-DOJ-AT-00132404
591. GOOG-DOJ-AT-00175537
592. GOOG-DOJ-AT-00248208
593. GOOG-DOJ-AT-00569648
594. GOOG-DOJ-AT-00593652
595. GOOG-DOJ-AT-00766768
596. GOOG-DOJ-AT-00832170
597. GOOG-DOJ-AT-01128809
598. GOOG-DOJ-AT-01130451
599. GOOG-DOJ-AT-01132404
600. GOOG-DOJ-AT-01424891
601. GOOG-DOJ-AT-01509153
602. GOOG-DOJ-AT-01516187
603. GOOG-DOJ-AT-01688915
604. GOOG-DOJ-AT-01806366
605. GOOG-DOJ-AT-01811903
606. GOOG-DOJ-AT-01850893
607. GOOG-DOJ-AT-02153427
608. GOOG-DOJ-AT-02193461

609. GOOG-DOJ-AT-02274670
610. GOOG-DOJ-AT-02421520
611. GOOG-DOJ-AT-02471194
612. GOOG-DOJ-AT-02513569
613. GOOG-NE-01431592
614. GOOG-NE-02076786
615. GOOG-NE-02345621
616. GOOG-NE-02554130
617. GOOG-NE-03600548
618. GOOG-NE-03607743
619. GOOG-NE-03726852
620. GOOG-NE-03848047
621. GOOG-NE-03898431
622. GOOG-NE-04398144
623. GOOG-NE-04410440
624. GOOG-NE-04426530
625. GOOG-NE-04442375
626. GOOG-NE-04526416
627. GOOG-NE-05243813-61
628. GOOG-NE-05313828
629. GOOG-NE-06262958
630. GOOG-NE-06592460
631. GOOG-NE-06827960
632. GOOG-NE-06842715
633. GOOG-NE-07289269
634. GOOG-NE-07290902
635. GOOG-NE-09158358
636. GOOG-NE-09485306
637. GOOG-NE-10587467
638. GOOG-NE-10669044
639. GOOG-NE-10976654
640. GOOG-NE-1097667
641. GOOG-NE-11313727
642. GOOG-NE-11719786
643. GOOG-NE-11725453
644. GOOG-NE-11753797
645. GOOG-NE-13202009
646. GOOG-NE-13202712
647. GOOG-NE-13222715
648. GOOG-NE-13388638
649. GOOG-NE-13589792
650. GOOG-NE-13592273
651. GOOG-NE-13624783
652. GOOG-NE-13624790
653. GOOG-TEX-00000611
654. GOOG-TEX-00035601
655. GOOG-TEX-00036124
656. GOOG-TEX-00040398
657. GOOG-TEX-00083356
658. GOOG-TEX-00083712
659. GOOG-TEX-000884837

660. GOOG-TEX-00090751
661. GOOG-TEX-00094890
662. GOOG-TEX-00096937
663. GOOG-TEX-00097138
664. GOOG-TEX-00104327
665. GOOG-TEX-00106499
666. GOOG-TEX-00109645
667. GOOG-TEX-00122137
668. GOOG-TEX-00151409
669. GOOG-TEX-00202982
670. GOOG-TEX-00221307
671. GOOG-TEX-00230133
672. GOOG-TEX-00253130
673. GOOG-TEX-00358731
674. GOOG-TEX-00594205
675. GOOG-TEX-00595270
676. GOOG-TEX-00650912
677. GOOG-TEX-00782851
678. GOOG-TEX-00783448
679. GOOG-TEX-00840587
680. GOOG-TEX-00841386
681. GOOG-TEX-0084837
682. GOOG-TEX-0089405
683. GOOG-TEX-0090341
684. GOOG-TEX-0090961
685. GOOG-TEX-0090969
686. GOOG-TEX-00921231
687. GOOG-TEX-00929130
688. GOOG-TEX-00985828
689. GOOG-TEX-01008173
690. GOOG-TEX-01008266
691. GOOG-TEX-01217618
692. [redacted]-00000001
693. [redacted]-00002458
694. [redacted]_0007505934
695. [redacted]0000991634
696. [redacted]_0000072073